DEC 30 1935

Engineering News-Record

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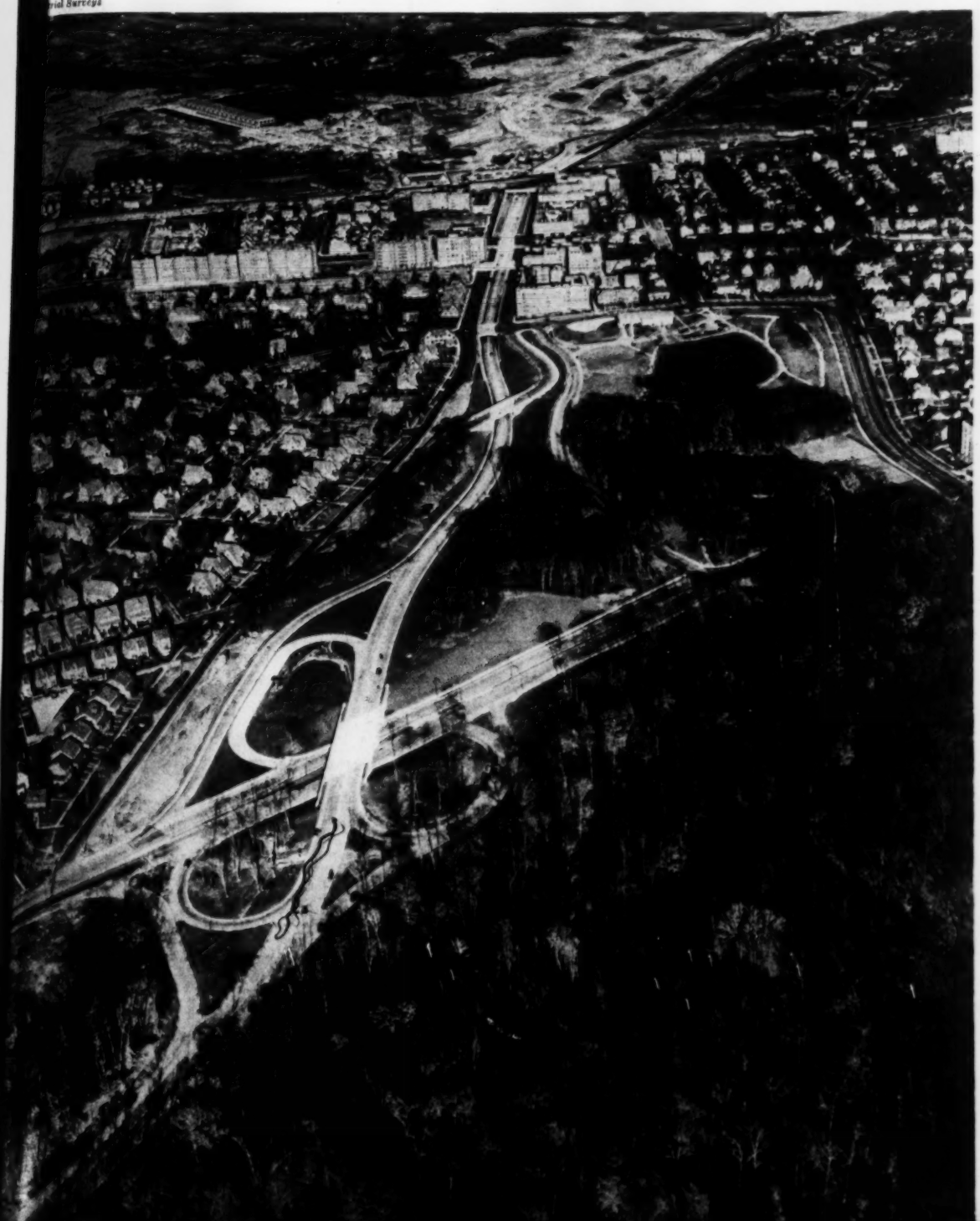
McGraw-Hill Publishing Company, Inc. December 26, 1935 Twenty-five Cents, Five Dollars per Year



Interborough Parkway from Brooklyn approaching intersection with parkway routes to Long Island and to the new Triborough Bridge.

IN THIS ISSUE:

Interborough Parkway, New York

•

Boulder Dam Construction In Review

•

Drill Bit Experience of TVA

•

Sewage Practice Notes

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Highway Officials Meeting

SHOW-DOWN POWER WORKS FOR 'ION

A "Caterpillar" Diesel D-11,000 Engine powers this Pioneer Duplex No. 15 Cru working near Twin Falls, Idaho. Fuel consumption is less than four gallons per h

The Pioneer Gravel Equipment Mfg. Co., Minneapolis, Min offers its semi-portable and trailer gravel plants powered "Caterpillar" Diesel Engines because . . . "Caterpillar" Die power means rock-bottom fuel costs, less fuel to haul to the pla . . . the "Caterpillar" Diesel Engine is built to stand rough wo its construction is simple and its maintenance costs are low . "Caterpillar" Diesel power is dependable and flexible, taking lo hours and varying loads in its stride. Ask your dealer why it is t power SHOW-DOWN. Caterpillar Tractor Co., Peoria, Ill., U.S.

CATERPILLAR DIESE

REG. U. S. PAT. OFF.

Roads to Oregon

JUST about one hundred years ago a trail, crossing the Missouri state line into the open country that now is Kansas, wound its way for nearly two thousand miles over prairie, plains and mountains to the Pacific coast. Broken originally by Indians and trappers, worn in part by wheels but chiefly by the hoofs of mules and horses, it afforded for its whole length not even the shelter of a log cabin. It was the Oregon Trail, parent stem of all the thoroughfares that since have traversed the central belt of the continent.

Over it was soon to flow the incessant procession of the empire builders, those who would harvest the fertile valleys of the northwest and dig the treasure from the heart of the Sierras and the Rockies. Truly this was a highway of opportunity, tapping new wealth for those who dared its perils and survived its hardships. For all those who set out so hopefully from the eastern settlements did not attain their Promised Land.

ABOUT forty miles out, the Oregon Trail took off from the older Santa Fé Trail which it had followed to that point. And at that momentous road-fork someone erected in the early days a rude sign on which he lettered, "Road to Oregon." There, on that vast solitude of open prairie and infinite blue sky, this frail finger beckoned the pioneer into the unknown, turning his steps into a path from which he would find no turning for weeks and months of toil, hardship and apprehension. But at the end lay Oregon, symbol of accomplishment and of wealth.

As Chittenden so well put it, "surely so unostentatious a sign never before nor since announced so long a journey."

In present day values the advertising pages of this and kindred journals are quite as significant as was that historic sign. What though we do not always recognize them as such? No more did those aspiring emigrants, preoccupied with the cares of their daily progress, see in that earlier sign the finger of destiny. They saw merely a common sign-board; we just see someone's advertisement.

But as that sign marked a road to wealth and achievement, so each advertisement tells today of someone's venture over such a highway. Through the years many of them have won through, each to his Oregon; today his advertising bears witness to his accomplishment and his present vigor. But others who started lost heart on the way; their signs faded from the market place. Still others, despite their courage and their striving, perished en route. Some were swallowed by the quicksands of shifting markets, some succumbed to the diseases of deficient management, others were destroyed or turned back by the hostile forays of competition. The Road to Oregon is strewn with the relics of those who failed in wisdom, strength or courage.

Today all this is peculiarly significant. For it was the depression of 1837 that launched on the Oregon Trail its first great impulse of emigration. The tide of expansion that had carried the white man to the border of the Indian country had left him there, secure and content in the settlements. But under the whip of that depression, thousands dared the menace of the unfriendly plains to seek new wealth and a new start in a new land. With the decades, each successive cycle of depression contributed its quota to those who sought their Oregon.

SO IT IS today. To be sure, it is no frontier of plain or mountain that our modern adventurers move out to conquer. But in every field of industry, under the spur of depression, new men with new enterprise are faring forth to seek new markets and new opportunities. They know the perils ahead of them but they dare to risk them; they know the need for shrewd management but they trust their resourcefulness; they know that long-established competitors will resist invasion of the choicest hunting grounds but they will dare to battle for their share. This depression is ending, as all the rest have ended, in a surge of new enterprise toward new horizons of business opportunity.

And each advertisement now set up by business enterprise, whether to win new progress or to secure present standing, carries for the nation the same promise of high achievement as did that other sign which a century ago pointed out the first Road to Oregon.

Willard Chevalier

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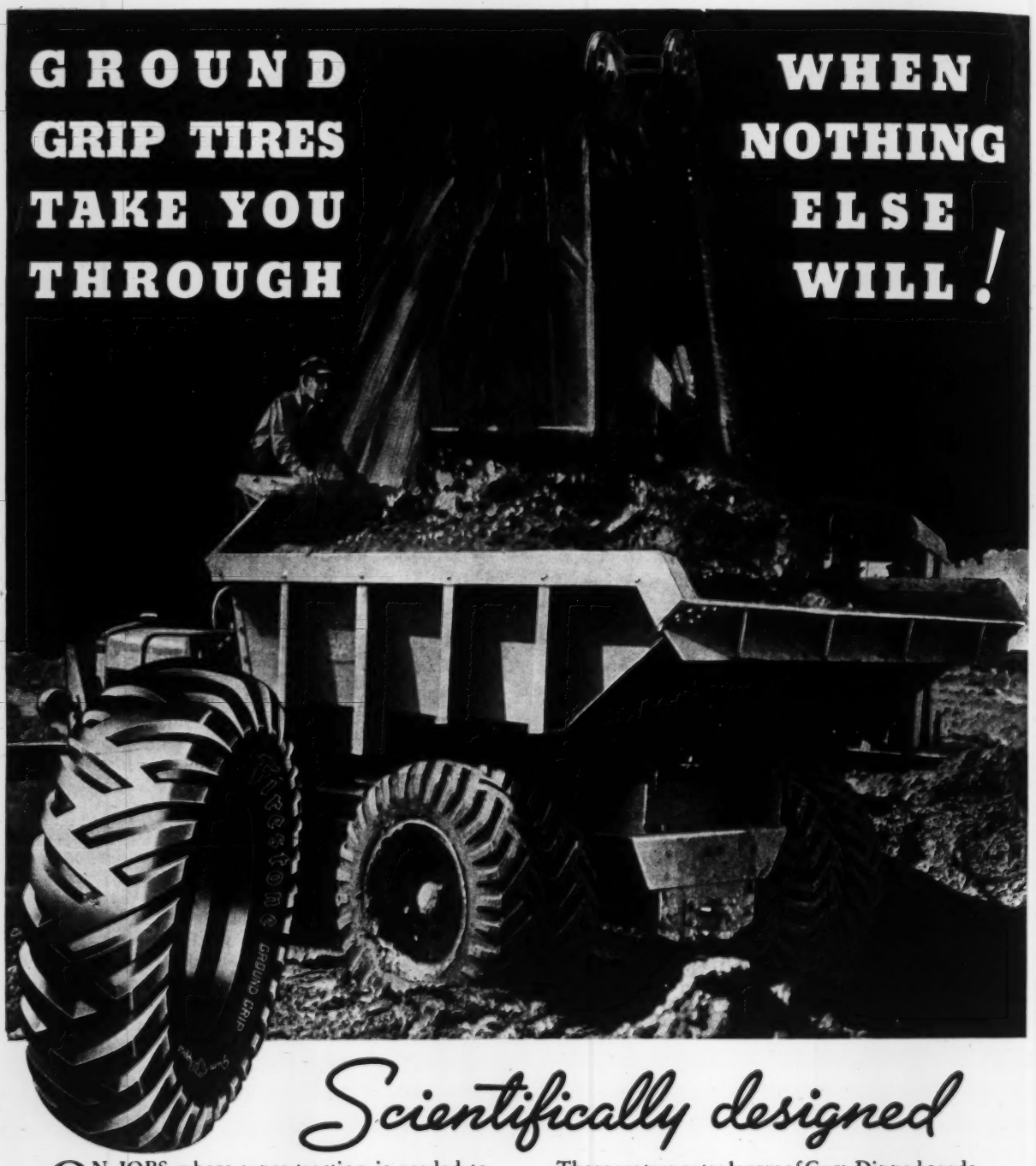


Scientifically designed

ON JOBS where super-traction is needed to pull through soft ground, loose earth, mud, sand or snow, Ground Grip Tires have no equal. The rugged, scientifically designed Ground Grip tread grips where other tires, even with chains, would leave you stranded.

The body of this remarkable tire is built with Gum-Dipped High Stretch cords, giving it super-strength to withstand the terrific strains under heavy loads.

There are two extra layers of Gum-Dipped cords between the tread and body, permanently locking them together. These are patented Firestone construction features not used in any other tire.

Equip your trucks with Firestone Ground Grip Tires—you will save more time and do more work at lower operating cost. Specify Firestone Ground Grip Tires on your new equipment. The nearby Firestone Auto Supply and Service Store or Firestone Tire Dealer is ready to serve you.

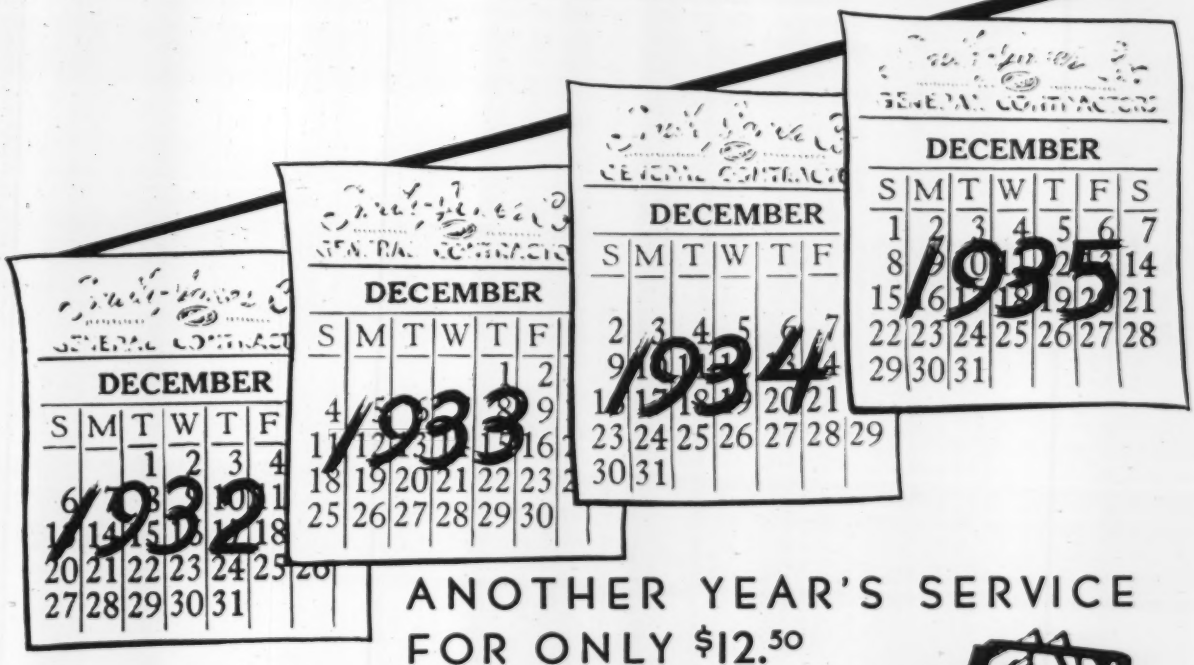
• • •

Listen to the Voice of Firestone featuring Richard Crooks or Nelson Eddy—with Margaret Speaks, Monday evenings over Nationwide N. B. C.—WEAF Network

Firestone

© 1935, F. T. & R. Co.

FULLER-KINYON PUMPS *for* LONG-LIFE SERVICE



ANOTHER YEAR'S SERVICE FOR ONLY $12.50

FULLER-KINYON Portable Pumps can "take it". Years of contact with the construction field and experience in the manufacture of heavy equipment, has only served to confirm our policy that materials and workmanship of the finest quality should at all times be built into Fuller equipment.

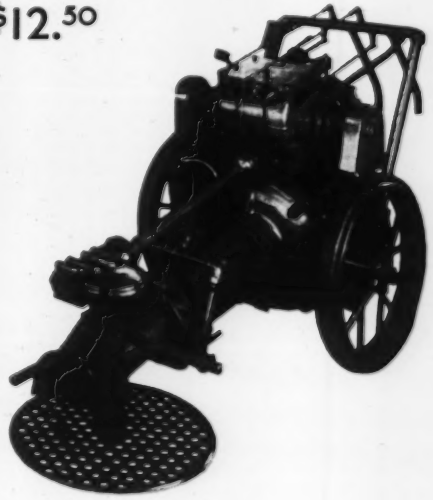
The proof of such "built in" construction is shown in a statement made just recently by a contractor who purchased a Fuller-Kinyon Pump in 1932.

> "This machine has unloaded nearly 500 cars of cement with cost for repairs about $50.00." He said he had never had any trouble with the machine and added that it was the *most dependable piece of equipment* they had in their plant.

It will pay you to investigate this modern method of unloading bulk cement from either box cars or barges, regardless of the size of the jobs you are bidding on, since this piece of equipment need not be discarded upon the completion of one contract but can very easily be moved from one job to another at very little expense. Many of these machines are now serving their fourth to sixth job.

Fuller Company
CATASAUQUA, PENNA. U. S. A.

Chicago: 1118 Marquette Bldg.
San Francisco: 564 Market St.



Fuller-Kinyon Portable Cement Pumps are the only conveyors capable of handling cement under all plant conditions. They unload box cars and barges and recover cement from simple storage sheds with equal facility.

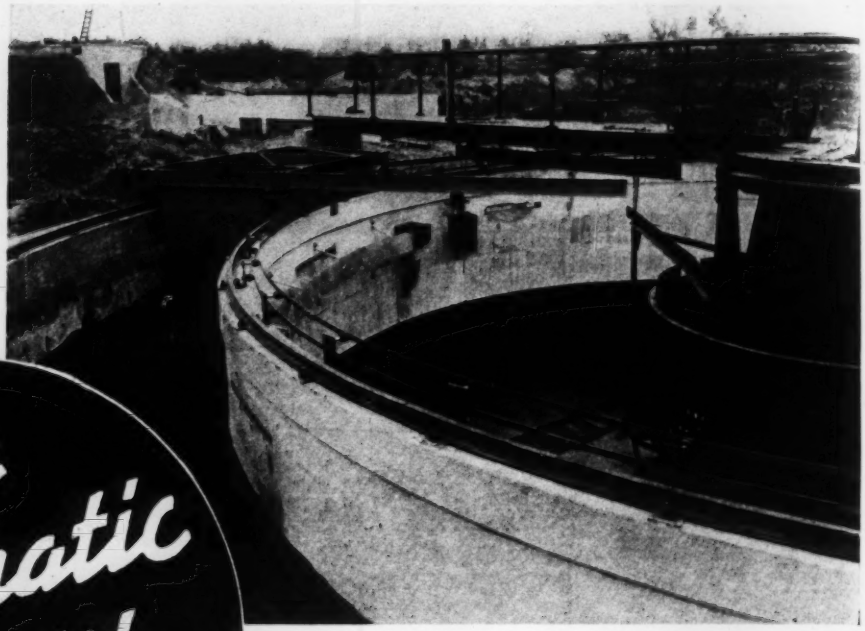
FULLER COMPANY
CATASAUQUA, PA.

Send me literature on Portable Pumps

NAME _____

FIRM _____

ADDRESS _____



VIEW
of Filter Bed and Traveling Cleaner installed on circular tank at Goshen, Indiana. Walter S. Bemis, (Chicago) Consulting Engineer.

The Automatic Magnetite Filter

provides a New Intermediate Step in Sewage Treatment

●

RESULTS of first sewage treatment plant using the automatic magnetite filter on plain sedimentation tank.

At the Perth Amboy, N. J., plant for the month of October, 1935, on plain sedimentation:

Total Sewage Treated	75.29	MG.
Average Suspended Parts in Raw Sewage	200	ppm
Average Suspended Parts in Effluent	59.5	ppm
Percent Removal	70.4	ppm

●

WHATEVER system of sewage treatment you have . . . or are planning . . . plain Sedimentation—Chemical Precipitation—Activated Sludge . . . it will operate more effectively and at lower cost per ton of dry solids removed with the Automatic Magnetite Filter! Send for our latest bulletin.

and

for the first time on a plant scale, raw sewage sludge is being filtered with moderate conditioning, resulting in low moisture content and high filtering rates with the

CONKEY
Rotary Vacuum Filter

FILTRATION EQUIPMENT CORP.

10 East 40th Street — Sales Office — New York, N. Y.

COARSE SCREENS • AUTOMATIC MAGNETITE FILTERS • CONKEY VACUUM FILTERS

"Shield-Arc" WELDING CUT COST OF THIS JOB

Photo courtesy of Southern Steel Works Company, Birmingham, Ala.

DESIGNED for riveting, yet *"Shield-Arc"* welding cut the cost of shop and field fabrication of this auditorium framework. Handicapped by a design costly to welding, *"Shield-Arc"* proved its greater economy.

Learn the advantages of this modern structural fabricating process. It simplifies layout and connection details. Eliminates practically all punching. Reduces handling in the shop. Is quiet in the field. Yet it produces a stronger, stiffer structure with less tonnage than any other method of steel fabrication.

But if you would reap all of the profits of progress you must use the *"Shield-Arc"* welder. It is the only welder that can fulfill its guarantee three ways to produce more welding per dollar. Find out now what this guarantee means to you. Ask THE LINCOLN ELECTRIC COMPANY, DEPT. F-195, CLEVELAND, OHIO. Largest Manufacturers of Arc Welding Equipment in the World.

POP "I've designed a good many structures but this arc-welded job had me stuck until Lincoln showed us how."

LAD "And they showed us the answer right in the New Lincoln Handbook. It has 133 out of 586 pages devoted exclusively to structural design with detail drawings. Costs only $1.50. I'm ordering it today so we can get up-to-date on welding."

Mail this Coupon TODAY

THE LINCOLN ELECTRIC COMPANY,
Dept. F-195, Cleveland, Ohio

Gentlemen: Please send all the facts on the *"Shield-Arc."* ☐ Enclosed is $1.50 for New Lincoln Handbook.

Firm .....

Your Name ..... Title .....

Address .....

City ..... State .....

SCIENCE *plus* EXPERIENCE

The most modern scientific knowledge directs the design and construction of LAYNE Pumps and Well Water Systems. Unceasing research and experiment by a staff of hydrological experts assures up-to-the-minute design and efficiency.

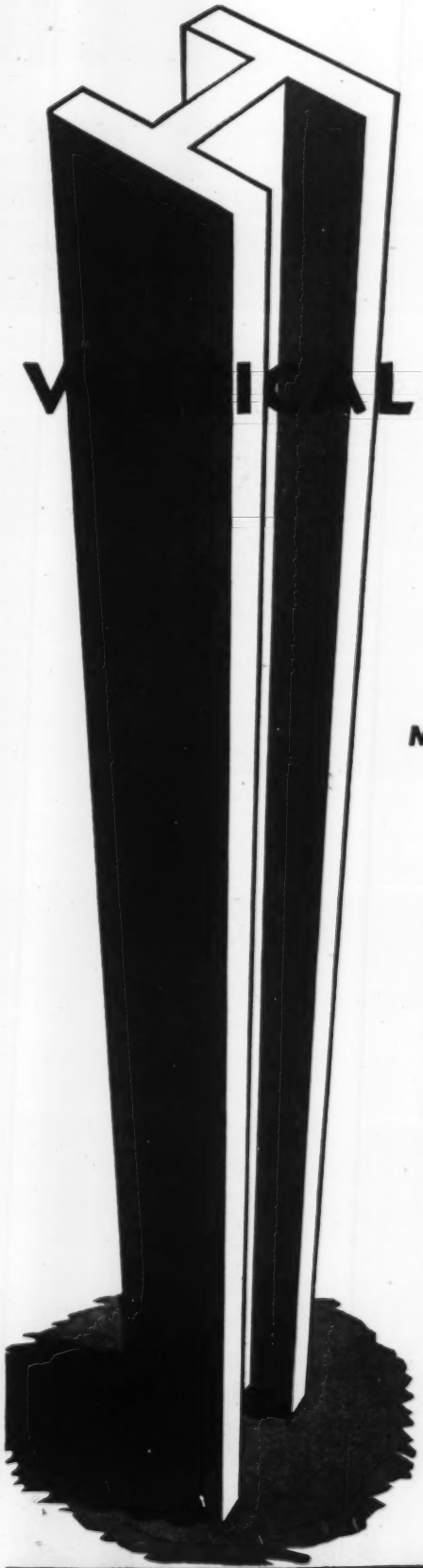
But equally important is the invaluable store of priceless practical experience that LAYNE has harvested during more than 50 years of building pumps and water supply systems to meet almost every conceivable condition the wide world over. Why not take advantage of this combination of scientific exactness tempered by a half century's practical experience to help you solve your water supply problem? Near you is a trained LAYNE representative who will gladly discuss and analyze your problem with you without obligating you in the least. Simply address a letter or card to

LAYNE & BOWLER, INC.

General Offices, Dept. C Memphis, Tennessee

World's Largest Water Developers

LAYNE PUMPS
AND WELL WATER SYSTEMS



FOR EFFICIENT VERTICAL LOAD CARRYING

CB

I Sections I

May be used as combination bearing piles and columns in a wide range of applications. Particularly notable are these:

1. Where exceptionally hard driving conditions are encountered.
2. Where salt water or seaboard exposure requires careful protection against weathering, or boring worms.
3. Where the scouring effects of stream-borne sand and rock must be guarded against.
4. Where heavy loads must be carried on individual piles.
5. Where piles must act as free standing columns of great height.
6. Where substantial bottoms are difficult of access.
7. Where the pile may be required to resist lateral forces, causing bending stresses.

In these and in many other situations, the steel bearing pile is serving both bridge and building engineers. More complete information regarding the various sections available and their physical characteristics will be furnished upon request.

CARNEGIE-ILLINOIS STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA • CHICAGO, ILLINOIS

Pacific Coast Distributor: Columbia Steel Company, San Francisco

United States Steel Corporation Subsidiary

Our Engineers Must Say It's

"Flex-Set" Preformed

"OK"

As soon as the wire comes into the factory, our Engineers step in and make it *prove* that it is good enough for "Flex-Set" Preformed Yellow Strand. Then, and then only, does it ever receive their "O. K."

Strict supervision follows every process of manufacture; and just before wires and strands become rope, preforming shapes the strands into the helical form they occupy permanently.

Thus "Flex-Set" Preformed Yellow Strand is practically pre-broken in. It is limp and tractable. Handles easily. Runs smoothly. Resists kinking and fatigue. Lasts much longer than ordinary construction rope on most installations.

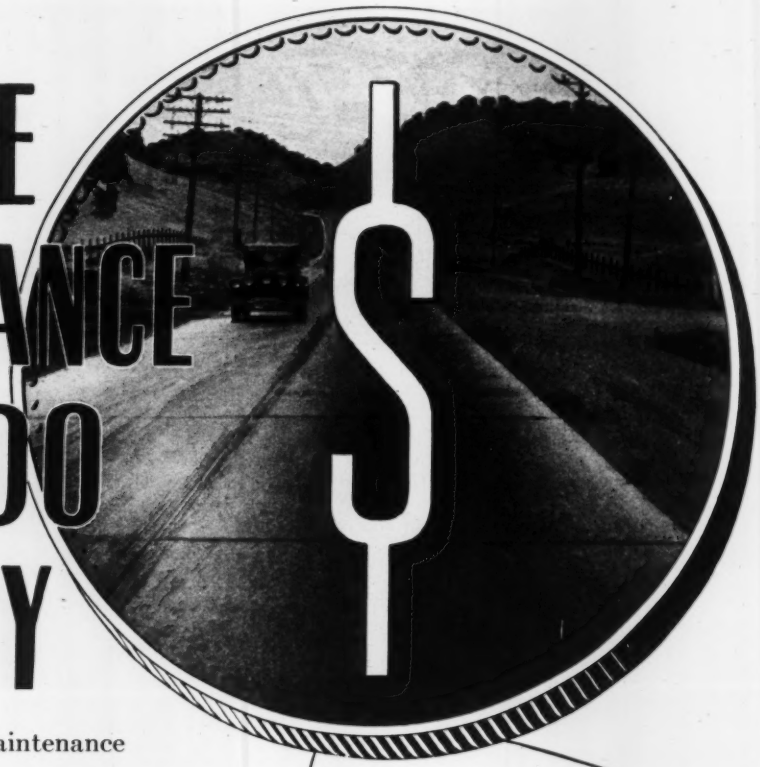
Let us tell you if "Flex-Set" Preformed Yellow Strand is the rope for your use.

BRODERICK & BASCOM ROPE CO., St. Louis

Factories: St. Louis and Seattle . . . . . Branches: New York, Seattle, Portland, Houston

Yellow Strand

MAKE THE MAINTENANCE DOLLAR DO FULL DUTY



To get the most out of surface maintenance funds *pavements must be of concrete.*

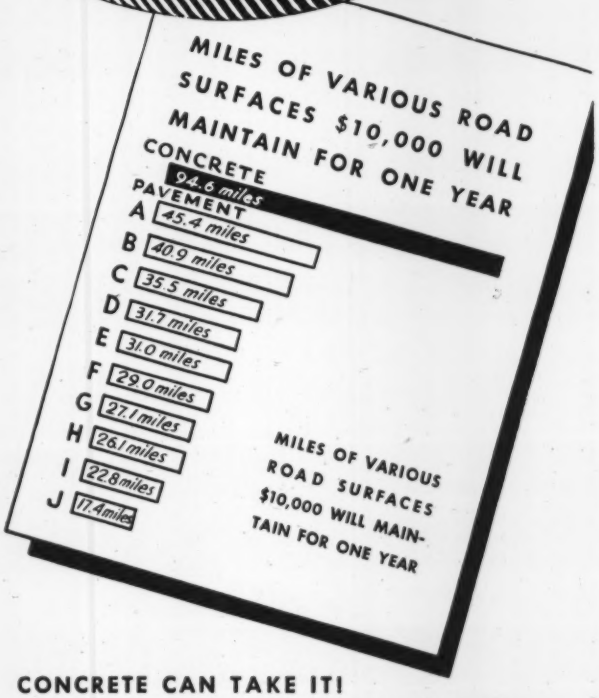
This statement is proved by actual cost figures from the eighteen states which publish comparable records.

Maintenance costs, of course, should be judged from the whole life of the pavement and not by a single year or any other short period. Therefore, all comparisons should extend over as many years as possible.

The Portland Cement Association has compiled a summary of available records which covers all types of pavements over periods as high as 14 years and averaging 7 consecutive years prior to January 1, 1935. The cost averages obtained are given further authority by the fact that they cover 100,000 miles—nearly a third of the improved state highway mileage in the United States.

Concrete was found to average $105 per mile per year for surface maintenance—$114 to $469 less than any other type of pavement.

PORTLAND CEMENT ASSOCIATION
Room 8124, 33 West Grand Avenue, Chicago, Illinois


MILES OF VARIOUS ROAD SURFACES $10,000 WILL MAINTAIN FOR ONE YEAR
CONCRETE PAVEMENT 94.6 miles
A 45.4 miles
B 40.9 miles
C 35.5 miles
D 31.7 miles
E 31.0 miles
F 29.0 miles
G 27.1 miles
H 26.1 miles
I 22.8 miles
J 17.4 miles
MILES OF VARIOUS ROAD SURFACES $10,000 WILL MAINTAIN FOR ONE YEAR

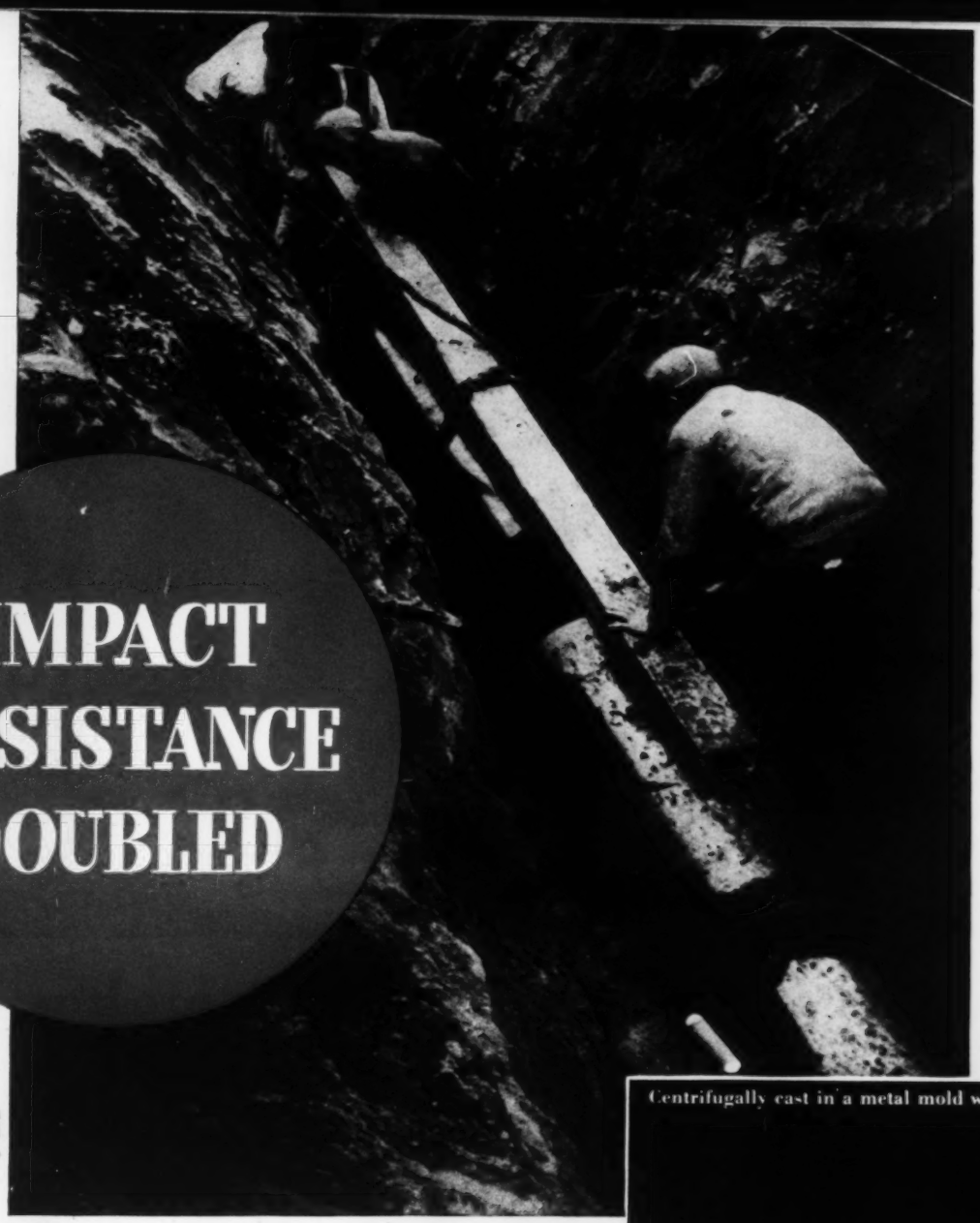
CONCRETE CAN TAKE IT!

Low maintenance costs for concrete are all the more significant because the average daily traffic on concrete is in excess of 1000 vehicles. Some of the other types enumerated in the summary have relatively little traffic, but heavy maintenance expense.

CONCRETE HAS PUBLIC ACCEPTANCE

Motorists judge all roads by the standards of safety, economy and comfort set by concrete. They know that concrete lowers their gas, tire and car repair expense—that it is smooth but non-skid—clearly visible at night—safe at modern speeds.

Write for the report entitled "Road Maintenance Costs as told by Available State Highway Records."



IMPACT RESISTANCE DOUBLED

Recent installation of Super-de Lavaud Pipe at Pensauken, New Jersey

A 270-year-old main in France still transports water—a 500-year-old temple roof in China still sheds rain — both are cast iron. The passing centuries which have proved cast iron's effective resistance to rust have also witnessed great advances in the manufacture of cast iron pipe. The Super-de Lavaud Process, developed and patented by this Company, is the first commercially practicable method of producing *unchilled* gray iron castings in a metal mold. Super-de Lavaud Pipe with doubled impact strength, *cast without chill in a metal mold*, was publicly announced in February 1934. In December 1935, with nearly 9 million feet installed, evidence is overwhelming to the effect that Super-de Lavaud is a stronger, tougher, more ductile pipe. Ask for descriptive literature.

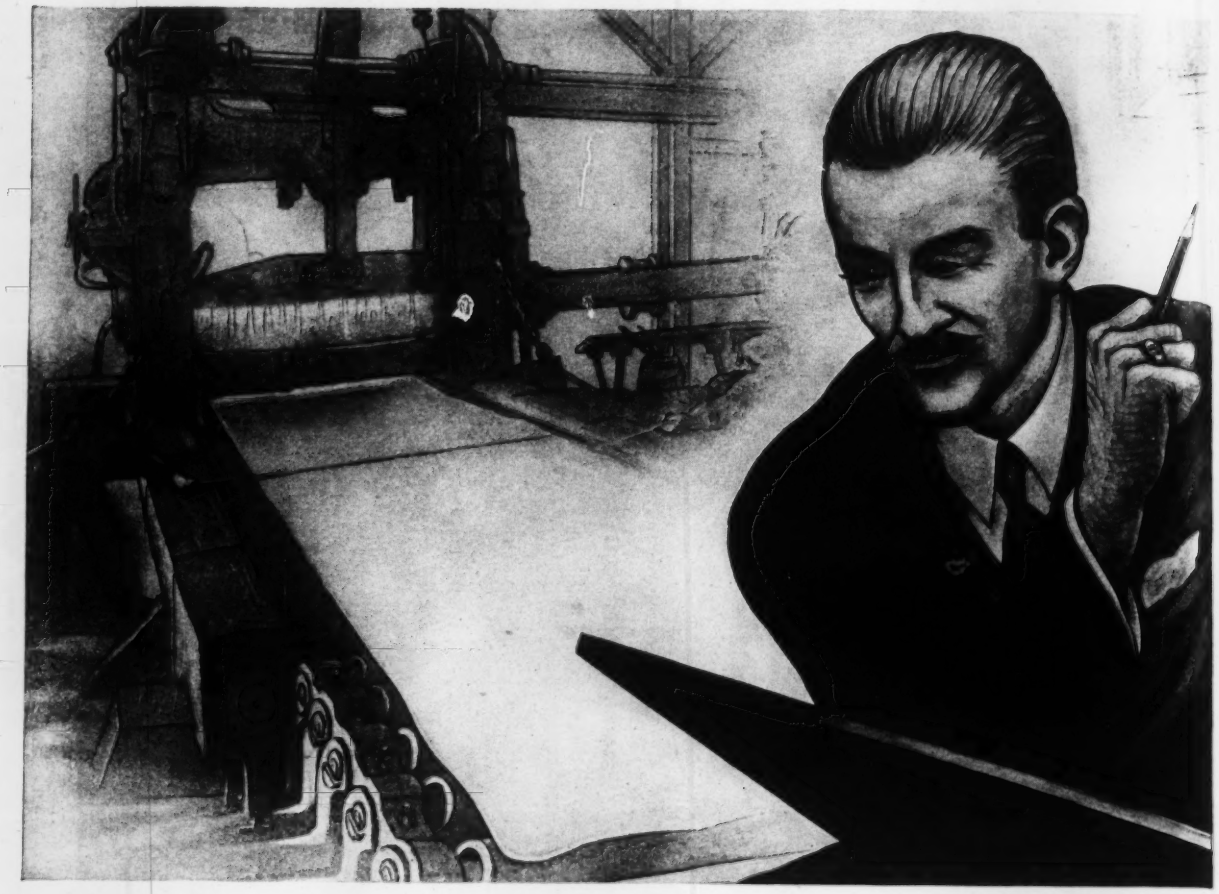
Centrifugally cast in a metal mold without chill

U.S. SUPER-de LAVAUD PIPE

CAST WITHOUT CHILL IN A METAL MOLD

UNITED STATES PIPE AND FOUNDRY CO., General Office: BURLINGTON, N. J.

Foundries and Sales Offices throughout the United States



Diversity of Experience makes for Excellence in each Product

As with other steel products, the quality of structural steel depends on many factors, including the know-how of the mill personnel. The manufacturer who produces not only structural shapes, but also plates, bars, sheets, and other steel products, has the opportunity to acquire added proficiency in all phases of the steel-making art that is inevitably reflected in the product.

That is one reason why the engineer who has designed a project involving the use of steel may look with confidence to Bethlehem for the structural shapes that are required. Not only from the structural mills, but the plate mills—from the entire wide range of Bethlehem facilities—comes the knowledge of making steel materials of highest quality.

BETHLEHEM

STRUCTURAL SHAPES

The name Bethlehem has long been associated with the supplying of structural steel to serve every need of the engineer. The development of the famous Bethlehem Wide-Flange Sections many years ago, the more recent introduction of Bethlehem Light Sections, were two of the many steps Bethlehem has taken to make available to the engineer a range of sections capable of meeting any condition that may confront him.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

GENERAL OFFICES: BETHLEHEM, PA.

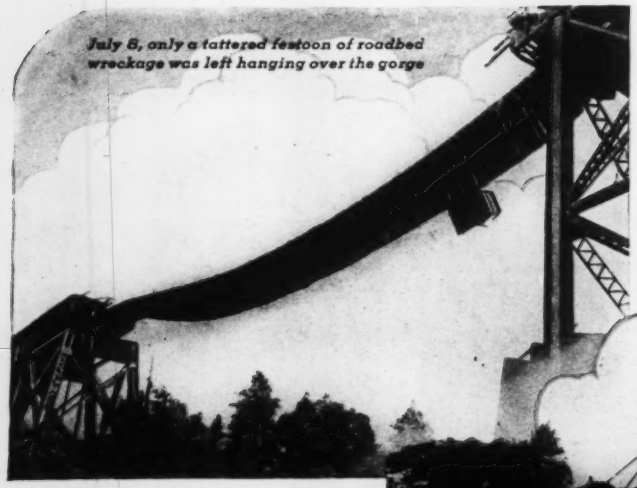
Roebling...

The pacemaker in wire rope development

THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.

John A. Roebling's Sons Co.,
Trenton New Jersey



July 8, only a tattered festoon of roadbed wreckage was left hanging over the gorge

Watkins Glen VIADUCT REBUILT *in Record Time*

August 4, derrick cars swinging heavy girders into place

ON JULY 8, 1935, unprecedented cloudbursts and floods had swept a whole region in New York and Pennsylvania and, along with much other damage, washed out the double-track viaduct of the New York Central Railroad, 165 feet above the gorge at Watkins Glen, N. Y.

ON JULY 12, first information on which to start rebuilding the structure was given to American Bridge Company

ON JULY 22, ten days after first information, American Bridge Company had prepared shop drawings, Carnegie Steel Company had turned out mill material, fabrication had been completed, and all the new steel needed, making up a train-load of 23 cars, left the Ambridge plant.

ON AUGUST 5, twenty-four days after first information, steelwork for both tracks was erected, roadbed for one track in place, and traffic resumed by passage of the first train over the rebuilt viaduct. A day later, everything was ready for laying the roadbed of the second track.

ON AUGUST 24, the viaduct was completed, to the driving of the last rivet.

July 22, loaded train of 23 cars leaving Ambridge, Pa.

IT was an unusual demonstration of swift action and ample resource that was called for in rebuilding the viaduct at Watkins Glen. Such demands do not often arise; but American Bridge Company facilities and personnel are always at command for adequate performance, not only on emergency projects but on any undertaking in the use of structural steel.

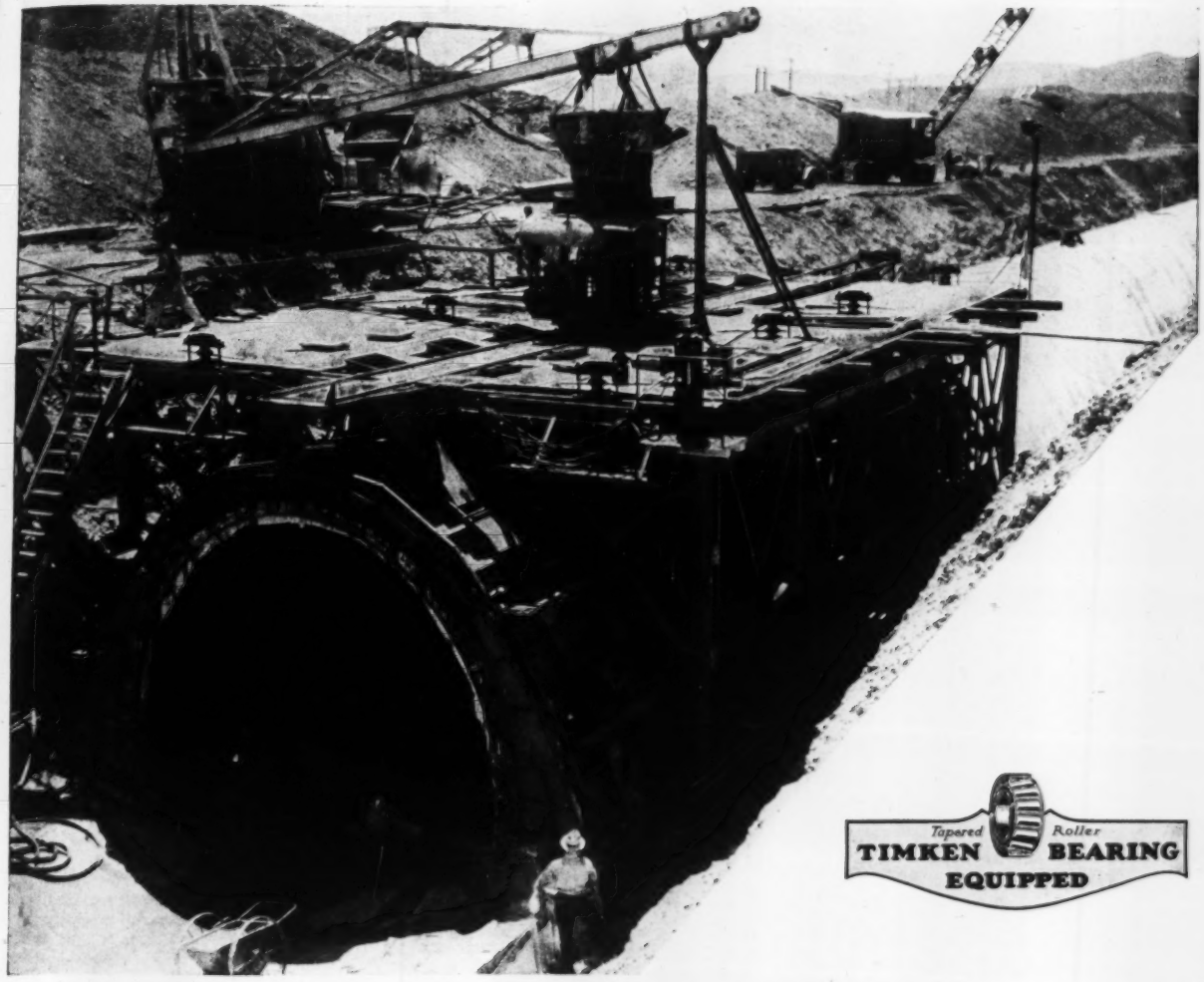
AMERICAN BRIDGE COMPANY

GENERAL OFFICES: *FRICK BUILDING • PITTSBURGH, PA.*

Baltimore Boston Chicago Cincinnati Cleveland Denver Detroit Duluth Minneapolis New York Philadelphia St. Louis Salt Lake City

Pacific Coast Distributors: **Columbia Steel Company, San Francisco** • ***Export Distributors:*** **United States Steel Products Company, New York**

United States Steel Corporation Subsidiary

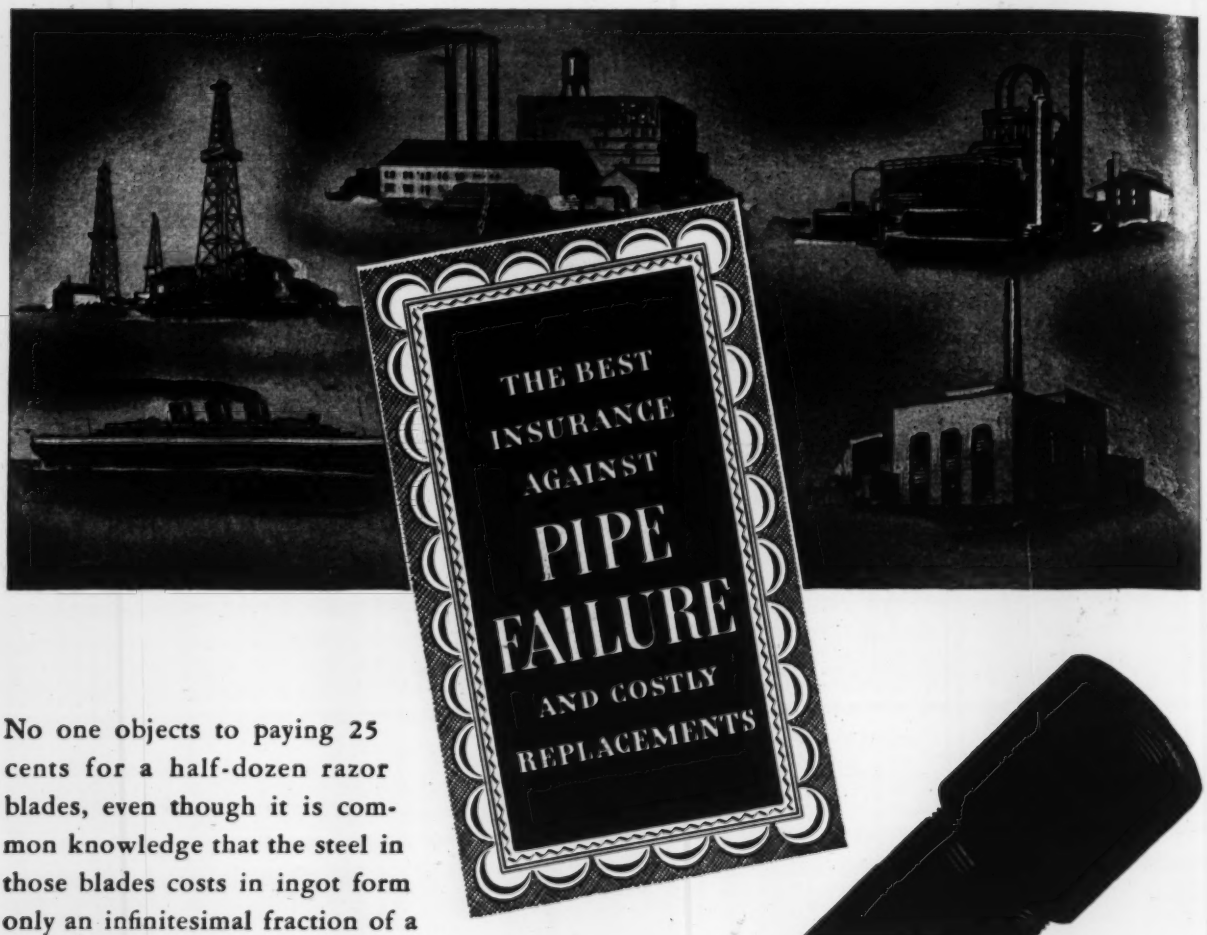


TIMKEN-EQUIPPED CONCRETE MIXERS SPEED UP BIG AQUEDUCT JOB

The construction of the Colorado River Aqueduct — the largest ever built — is a major job for concrete mixing equipment. The photograph shows a Ransome Dual Drum 27-E Paver equipped with 50-foot derrick boom working on a section of the big water tunnel. This machine contains 20 Timken Bearings — 8 in the drum rollers, 2 in the hoist drum, 4 in the boom bucket rollers, 4 on the countershaft and 2 in the traction clutch. The speed, dependability, life and earning power of any type of construction equipment are increased by the use of Timken Bearings because Timkens eliminate friction; carry radial, thrust and combined loads; and hold moving parts in correct and constant alignment. It pays to specify Timken-equipped.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN *TAPERED ROLLER* **BEARINGS**



No one objects to paying 25 cents for a half-dozen razor blades, even though it is common knowledge that the steel in those blades costs in ingot form only an infinitesimal fraction of a cent. Why?

Those blades do what the steel in the ingot could not do before work was done on it. You pay for the service the steel has been processed to do.

It's the same with Toncan Iron Pipe. Open hearth iron has been alloyed with copper and molybdenum and processed to resist corrosion—and it does to a greater degree than any other ferrous material in its price class. Naturally, it costs more than ordinary pipe, but don't figure it that way. Figure the slight additional cost of the pipe itself as insurance against pipe failure. Then you will quickly realize how slight a premium you are paying for long dependable service—how little you are paying to cut down repair and replacement expense. And don't forget that it costs more to tear out failed pipe and replace it with new than it costs to make the original pipe installation. So the smart thing to do is to install Toncan Copper Molybdenum Iron Pipe in the first place and save money.

TONCAN
COPPER MOLYBDENUM
IRON PIPE

Republic Steel
CORPORATION
GENERAL OFFICES · · · YOUNGSTOWN, OHIO

ENGINEERING NEWS-RECORD

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In the News:

"MANUFACTURING is not commerce nor any part of commerce. Nothing is more firmly established in constitutional law than that," said Judge Merrill E. Otis, of the federal district court, at Kansas City in his decision declaring the Wagner Labor Act void and upholding the right of a company to refuse to bargain collectively with its employees.

ST. LOUIS' PLAN for a riverfront park between the Eads and Municipal Bridges, which has been in the making for a quarter-century, comes a step nearer reality with the President's approval of it as a national park memorial to Thomas Jefferson. The city has already voted $7,500,000 bonds for its share of the financing. Local opposition to the plan is as vocal as the praise, however.

A NEW WATER SYSTEM for Little Rock, Ark., was assured last week with PWA approval of a loan and grant of $7,074,500.

PWA would not favor a free bridge between Omaha and Council Bluffs, as proposed by the governors of Nebraska and Iowa, if it would divert too much traffic from the new South Omaha toll bridge in which PWA has a stake.

COLORADO RIVER AQUEDUCT WATER will be available for sale to others besides the thirteen Californian cities now in the District, and a special water problems committee has been appointed to consider applications from unincorporated villages and highly developed agricultural sections.

THE THREE PUBLIC power developments in Nebraska which have been financed by the PWA are of doubtful economic soundness unless integrated into a single power-marketing entity, according to the findings of a board of five engineers appointed by Administrator Ickes. The physical features of the projects were found to be sound.

BOSTON'S MAYOR MANSFIELD has recommended to the city council the formation of a public-works department to consolidate ten existing agencies now engaged in various phases of engineering.

MEXICO plans to spend $10,000,000 to expand its highway facilities during 1936. About $7,000,000 will be spent to complete the Pan American Highway between Mexico City and Nuevo Laredo on the Rio Grande.

In This Issue:

OPENING of the Interborough Parkway on Long Island last month gave Brooklyn a connection to the extensive new parkway system in Queens, including the Triborough Bridge route now under construction. The parkway details and the problems of the grade-separations at the Brooklyn entrance are covered in an article in this issue.

A COMPARISON of detachable and forged drill bits made over a period of five months at the Norris Dam quarry of the Tennessee Valley Authority indicated an advantage for the removable bits largely on the score of faster drilling speeds.

SIMILAR EXPERIENCE with detachable bits is also reported in an article covering operations in three mines in Michigan, Tennessee and California.

THE ANNUAL MEETING of the American Association of State Highway Officials in Miami focussed much of its attention on the important problem of highway safety. The details of proposed traffic-control policies, of lighting requirements, grade-crossing elimination and many other safety measures as discussed at the meeting are covered in a staff report.

WORK ON BOULDER DAM is drawing to a close, two years ahead of schedule. The important work yet to be done is confined chiefly to the power house and penstock lines. In this issue, Walker Young, the construction engineer during most of the construction, reviews the major accomplishments and outlines what remains to be done. Power is expected to be produced early next year.

ANOTHER HIGH DAM has been built in France. It is a gravity-type structure as compared with Sautet Dam, which is an arch. It is 290 ft. high above streambed and 450 ft. above the deepest point of the foundation.

Index

An index for this volume of *Engineering News-Record*, Vol. 115, July-December, 1935, will be published with the issue of Jan. 16.

Coming Articles:

A REINFORCED-CONCRETE TRUSS of 170-ft. span, said to be the longest concrete span in American bridge practice exclusive of arches, has recently been completed near Tacoma, Wash. Utilizing broad shallow slabs for upper and lower chords and having the web members pierced by openings for sidewalks, the trusses are unusual in design as well as in span. Next week's lead article will be devoted to this significant structure.

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ENGINEERING NEWS-RECORD

December 26, 1935

Brooklyn's New Entrance to Long Island Parkways

Five-mile Interborough Parkway link with Grand Central Parkway terminates in a four-bridge grade-separation layout superimposed on a complicated pattern of Brooklyn streets

THE LONG ISLAND parkways are again reaching out for more customers to use the woodland and seashore parks that they connect. This time it is the populous borough of Brooklyn that is given access to the system via a grade-separated parkway. The new link, known as the Interborough Parkway, branches off the existing Grand Central Parkway at Kew Gardens and runs in a southwesterly direction for a distance of 4¾ miles to an entrance plaza just over the borough line in Brooklyn. This traffic entrance or distributing terminal, depending upon the point of view, consists of a group of four grade-separation bridges and a large plaza and provides connection with Pennsylvania, Bushwick and Jamaica Aves., three of the most important thoroughfares in Brooklyn. The four-bridge separation is interesting both in plan and construction largely because of its compactness, which was made necessary by a rather complicated street pattern and rough topography in a district of relatively high land values (Fig. 2). Three of the bridges are new, of concrete rigid-frame type and faced with stone. The fourth bridge is an existing steel-girder structure revamped to meet the new requirements while the old abutments are masked with concrete and stone.

The compact character of the Brooklyn entrance is a distinct contrast to the grade-separation layout at the opposite end of the Interborough Parkway where it forms one arm of the Y whose main stem is the Grand Central Parkway to Long Island and whose other arm is the Grand Central Parkway Extension to the Triborough Bridge. This latter intersection covers a strip 500 ft. wide and three-quarters of a mile long and is one of the most elaborate layouts ever built (*ENR*, Feb.

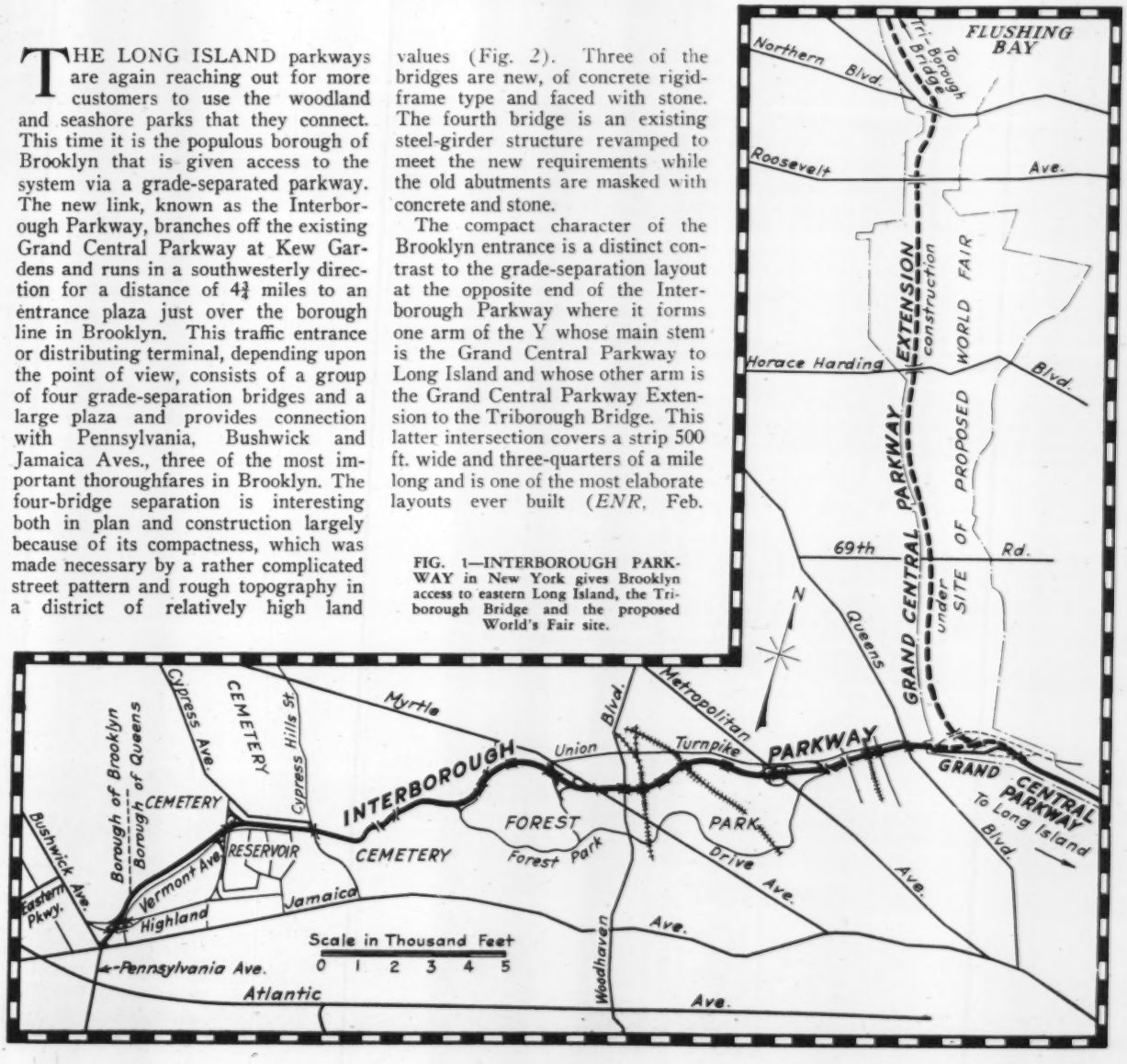


FIG. 1—INTERBOROUGH PARKWAY in New York gives Brooklyn access to eastern Long Island, the Triborough Bridge and the proposed World's Fair site.

FIG. 2—FOUR BRIDGES and a block-square plaza built into the edge of a hill constitute the Brooklyn entrance to the Interborough Parkway. Three main thoroughfares converge on the plaza, and three others are near by.

23, 1933). Its general character is well expressed by the term by which it has become popularly known—the pretzel.

The completion of the Interborough Parkway marks the culmination of 30 years of agitation for a direct arterial parkway between Brooklyn and Queens. After many delays the title to the right-of-way through Cypress Hills Cemetery was vested in the City of New York in September, 1928. In subsequent years the city completed the grading for the proposed parkway through the cemetery and constructed high retaining walls and bridges. The project, however, dragged until 1931, when the Long Island State Park Commission adopted plans to connect the original Interborough right-of-way with the Grand Central Parkway and with Brooklyn.

Beginning at the pretzel, the Interborough Parkway winds along a ridge of ground through Forest Park, through a series of cemeteries, then along the city's reservoir at Ridgewood, and finally along Highland Park to the Brooklyn entrance (Fig. 1). In its 4¼-mile length there are 26 grade-separation structures, including three railroad bridges, the four bridges in Brooklyn and the service road bridges. The parkway provided is similar in all respects to those previously built in the Long Island system (Fig. 3). The four-lane concrete slab, 44 ft. wide, is flanked by grass strips and lined with rough-sawed redwood light standards and, at fills, with guard-rails of the same material. The care exercised to retain the original character of the route unimpaired is reflected in the following demands on the contractor, taken from the specifications:

> Any stockpiles of material or any equipment stored shall be in cleared spaces away from all trees and shrubs.
>
> The contractor shall not establish borrowpits within 300 ft. of the parkway right-of-way.
>
> No tree or shrub shall be girdled, marked, painted or disfigured in any manner.
>
> No service road or roads other than the roads called for under this contract shall be cut through woods or any place on the right-of-way which will in any way damage existing planting.
>
> Clearing and grubbing shall be under the supervision of the engineer, and no trees or shrubs outside the construction area shall be taken out without his consent. The contractor shall replace and plant at his own expense any trees or shrubbery destroyed or damaged by his forces outside the said construction area.
>
> All fires shall be built in cleared open spaces and shall be guarded at all time.

For about a mile through Cypress Hills Cemetery, the route follows the old city right-of-way, lined on either side with concrete walls surmounted by heavy concrete balustrades. The state park commission authorities found it impossible to landscape this section through the cemetery so as to produce attractive results. Too costly to replace and yet regarded as an eyesore, the wall presented a considerable problem. The original plans were therefore modified; some of the unsightly concrete walls were entirely removed, some were lowered in height, and others were screened by plantings of vines and trees, and new fencing provided.

The only other places that the parkway departs from its typically woodland character is in the first quarter-mile near Kew Gardens and for a short distance either side of Woodhaven Blvd. At Kew Gardens, the parkway, after passing under Queens Blvd., is confined in a rather deep cut in a section heavily built up with apartment houses (Fig. 4).

The grade-separation structure at Queens Blvd. presented a major engineering problem which was solved with the cooperation of the Board of Transportation by the reconstruction of one of four separate levels at this point. The first, or upper, level carries Queens Boulevard traffic; the second level,

FIG. 3—BOTH IN WOODLAND and in built-up sections the grade-separated character of the parkway prevails. Left: as the Interborough Parkway will look when completed. Right: a three-span concrete rigid frame over Woodhaven Blvd., and a single-span frame over the Long Island Railroad.

which was widened and reconstructed, carries the Interborough Parkway and Union Turnpike; the third level provides for the new Queens Boulevard subway; and the fourth contains tracks for switching the subway cars to the storage yards in the Flushing Meadows, shown at the upper left in Fig. 4.

Although the plan of construction of the Brooklyn entrance is the element of the project that is of principal interest from the standpoint of innovation, some of the parkway details are worth noting. The pavement, where unreinforced, consists of a 7-in. base and a 2-in. top separated by a burlap fabric; when reinforcement is used (at the option of the contractor) the slab thickness is 8 in., and the topping 2½ in. These topping courses are colored by adding 3 per cent by weight of emulsified carbon black to the cement. For the unreinforced pavement, the base-course mix is 1:2½:5, and the top course 1:1½:2½. The concrete mix for the reinforced slab is 1:1¾:3½.

For the expansion joints, placed at 90-ft. intervals, premolded cork is used. The specifications require that a 1-in. thickness of this cork, when compressed to ½ in. shall recover 90 per cent of its original thickness within an hour after the pressure is released; also that under the same pressure as above and confined on three sides, the cork shall not extrude more than ⅛ in. on its free side. Metal joint supports of malleable casting are provided at expansion joints, to prevent uneven settlement of the pavement slab. Curves along the parkway are limited to a 2,000-ft. radius wherever possible, and there are many of a greater radius, since one of the basic tenets of Long Island Parkway planning is to confine tangent roadway to short lengths joining reverse curves.

FIG. 4—THE BEGINNING of the Interborough Parkway at Kew Gardens, where the roadway is in a deep cut rising from the "pretzel" grade-separation layout under construction in the background.

The problem of an entrance

Brooklyn, with a population of 2,785,000, has a difficult traffic problem, which is aggravated by the through traffic bound for Long Island points. Upon completion of the new Triborough Bridge connecting the Boroughs of Queens, Manhattan and Bronx, there will be a considerable increase in traffic from Brooklyn directed toward the Grand Central Parkway Extension, which will lead into the Triborough Bridge. The new Interborough Parkway has been planned to aid in the solution of this problem by extending its terminus into the Borough of Brooklyn, so that traffic will be collected from Highland Blvd., Pennsylvania Ave., Eastern Parkway, Bushwick Ave., Jamaica Ave. and Atlantic Ave., all of which are located at the collecting and distributing plaza of the parkway or come within a short distance of it. Through traffic to Long Island can now travel via the Interborough Parkway to the Grand Central-Northern State Parkway, which has already been completed to the middle of Nassau County and which is projected to continue easterly out to Suffolk County. Traffic from Brooklyn directed toward upper Manhattan, the Bronx and northern New York will take the Interborough Parkway to Kew Gardens, branch off on the Grand Central Parkway Extension and continue to the Triborough Bridge (Fig. 1).

The topography of the land at the Brooklyn entrance is that of a salient extending south just west of Vermont Ave., with a steep face toward Jamaica. Ave. lying to the south. This side hill proved to be an advantageous location for the grade-separation layout, since some of the required difference in elevation between the several roadways was available in the natural topography.

As shown in Fig. 5, the parkway passes straight through the intersection on the lower level, discharging its traffic into the plaza fronting on Pennsylvania, Bushwick and Jamaica Aves. Vermont Ave., in general parallel to the parkway on the east, is also on the lower level, while Highland Blvd. crosses the intersection at right angles to the parkway on the upper level, with its east and westbound traffic on separate alignments and bridges.

Brooklyn-bound traffic on the Interborough Parkway may go straight through the intersection to the plaza or bear right along the exit drive leading to Highland Blvd. westbound. Construction of this Highland Blvd. connection necessitated the heaviest grading work on the project, since it was necessary to replace an old retaining wall along the edge of the hill, to provide adequate space. The new wall (Fig. 2) is of reinforced concrete on cantilever footings and is faced with the

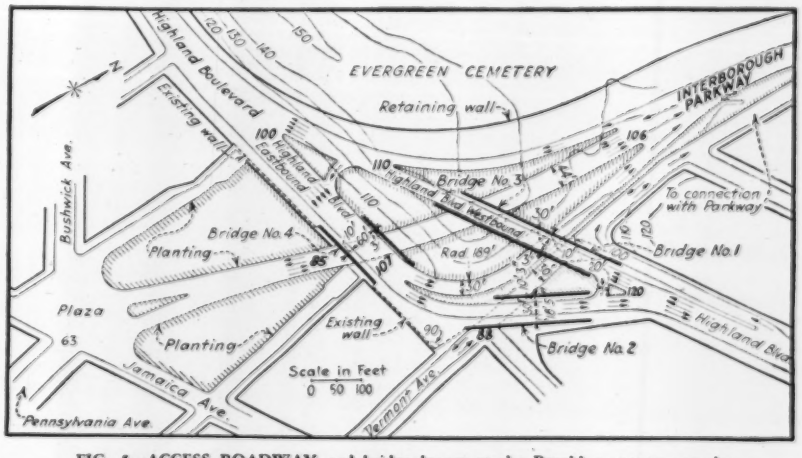


FIG. 5—ACCESS ROADWAY and bridge layout at the Brooklyn entrance to the Interborough Parkway.

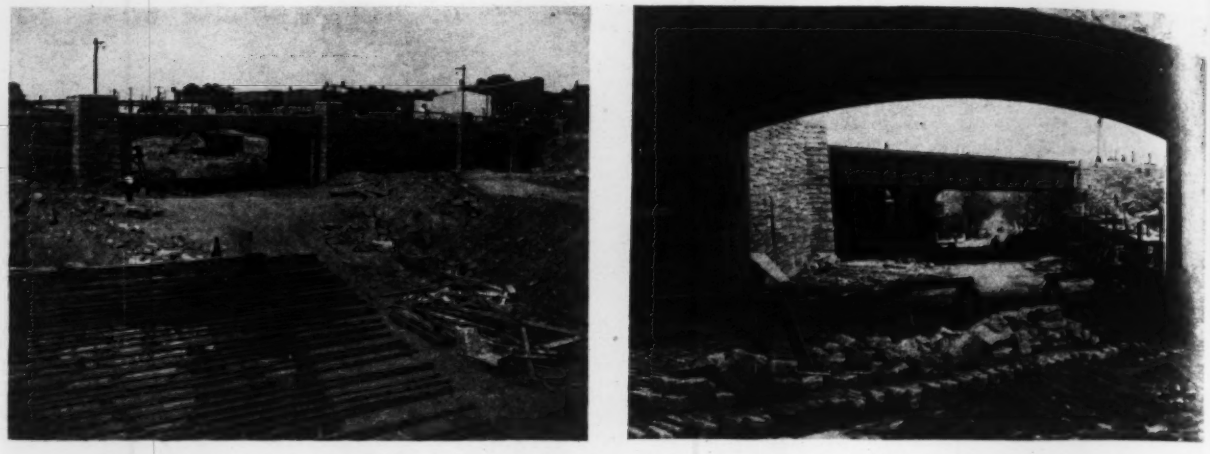


FIG. 6—HIGHLAND BOULEVARD BRIDGES under construction. Left: the two structures on the westbound roadway joined into a single masonry unit. Right: the bridges over Vermont Ave., showing the rebuilt steel bridge on Highland Boulevard eastbound.

masonry taken out of the old wall, which has been sandblasted to conform in appearance with the new stone facing on the bridges.

Long Island and Triborough Bridge traffic has three entrances to the parkway: (1) the first entrance is through the Pennsylvania Ave. plaza; (2) traffic eastbound on Highland Blvd. passes over the parkway and turns left down a ramp to a roadway passing under the Highland Blvd.'s westbound roadway and connecting with the parkway some 300 ft. to the north; (3) traffic westbound on Highland Blvd. enters a right turnout some distance east of the intersection, which leads it into Vermont Ave., which it follows for some 1,700 ft. north before connecting with the parkway.

The four bridges in the Brooklyn entrance layout are numbered as shown on Fig. 5, bridges 1 and 3 carrying Highland Blvd. westbound and bridges 2 and 4 Highland Blvd. eastbound. Bridge No. 2 is the remodeled steel-girder bridge which formerly carried all Highland Blvd. traffic over Vermont Ave.

Bridge No. 1—The bridge that carries Highland Blvd. westbound over Vermont Ave. and the onbound access roadway to the parkway is a 23-deg. skewed two-span concrete rigid frame, the parkway skew span being 38 ft. 9½ in. and the Vermont Ave. span 47 ft. 6 in. The center pier is 3 ft. wide. The arch barrels are 46 ft. wide and have a 20-in. depth at the center. At the haunch the arch thickness is 2 ft. 4 in. for the parkway span and 3 ft. for the Vermont Ave. span. These spans provide for 30-ft. roadways. The Highland Blvd. roadway on top is also 30 ft., and in addition there are 3-ft. and 10-ft. sidewalks.

Bridge No. 2—The old steel-girder bridge built in 1896 consisted of eight lines of girders, the two exterior girders being of lattice type. It was 110 ft. wide, including two 7-ft. cantilever sidewalks. Reconstruction consisted in the removal of the two lines of girders on the north side of the bridge, and of both sidewalks, and the replacement of the old brick-base black-top pavement with a new concrete slab. To make this bridge conform in appearance with the other bridges in the layout, concrete walls were built at either end and faced with stone.

A steel-plate masking, with dummy stiffeners, was also placed over the south lattice girder to give it the appearance of a plate girder in conformity with the north elevation.

Bridge No. 3—This bridge, carrying Highland Blvd. westbound over the parkway, is a 42-deg. 40-min. skewed concrete rigid frame with a skewed span of 66 ft. 8 in. The wing walls of this bridge were extended to meet bridge No. 1, so that the two structures have the appearance of a single unit pierced by three underpasses.

Bridge No. 4—The bridge that carries Highland Blvd. eastbound over the parkway is a 28-deg. 47-min. skewed concrete rigid frame with a skewed span of 56 ft., in all respects of conventional design and construction. It is flanked on either end by stone-faced walls about 50 ft. long.

The total cost of construction of the Interborough Parkway was $3,300,000. These funds were provided from New York state appropriations and federal public-works funds. Contracts have been let by the state department of public works on plans approved by the Long Island state park commission and the city park department. The entire right-of-way was acquired by the city of New York. Upon completion of the landscaping and other parkway facilities, the Interborough Parkway will be turned over to the city park department for maintenance and operation.

The Interborough Parkway is a link in the comprehensive park and parkway system in New York City and on Long Island, being built under Robert Moses, commissioner of parks of the city of New York and president of the Long Island State Park Commission. Arthur E. Howland is chief engineer and general manager of the commission. Construction contracts on the Interborough Parkway were let by the state department of public works, of which J. J. Darcy is district engineer.

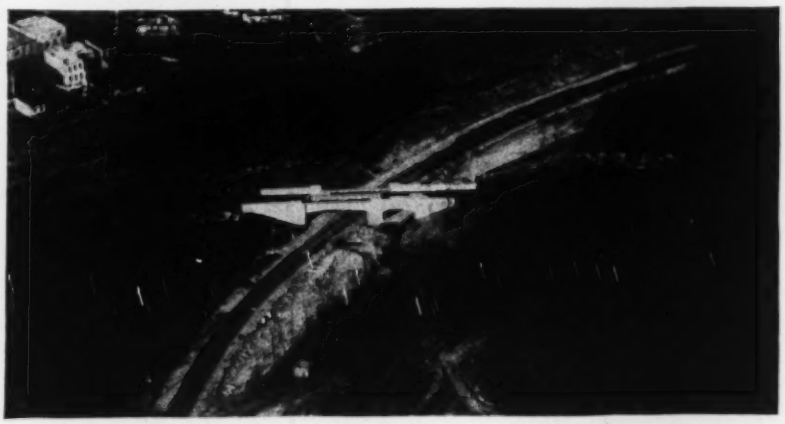


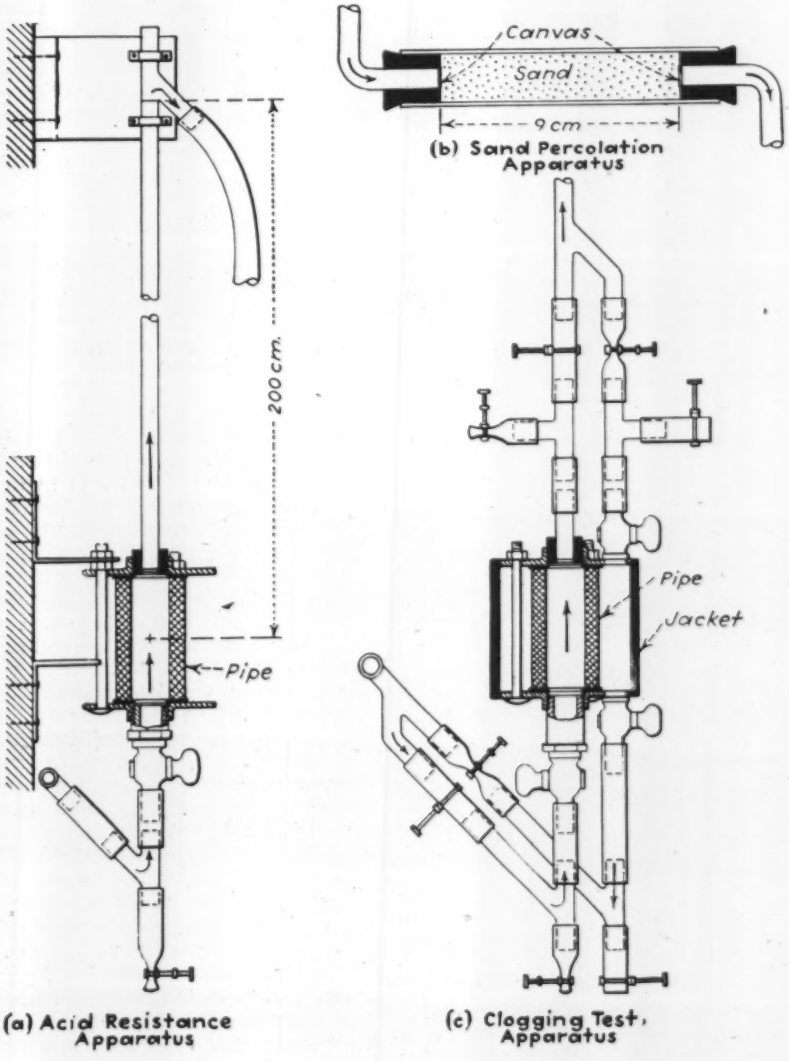
FIG. 7—RAILROAD CROSSINGS of the parkway are of steel-girder type. In this structure in Forest Park an opening is also provided for a bridle path.

Acid and Permeability Tests of Cement Pipe

ACID CORROSION and permeability tests of precast 1:2 cement-mortar pipe by Danish engineers have led to a number of conclusions of practical interest. As reported by E. Suenson in a bulletin (B 15) of *Ingeniorvidenskabelige Skrifter*, the study was organized by a joint committee of the Institute of Civil Engineers of Denmark and the Danish Cement Products Association, and the tests were made at the Building Research Laboratory of the Danish Royal Technical College.

In the opinion of the committee the tests have proved that it is feasible to produce a cement-mortar pipe that will permanently resist the corrosive action of aqueous solutions of carbonic acid and other acids that may occur in soils and in sewage. Eighty-two pipe lengths, most of them made of 1:2 portland cement mortar with 8 to 10 per cent water content, withstood the continuous flow of acid water, at a head of 6.6 ft., for 3¼ years, suffering thereby only an erosion of their interior surface to a depth of not quite ½ in. (0.7 mm.) The acid water contained 35 to 535 milligrams per liter of free carbonic acid and up to 135 milligrams per liter of aggressive carbonic acid, also about 240 milligrams per liter of bicarbonate carbonic acid. The apparatus used is shown by Fig. 1a. Some of the general conclusions are:

APPARATUS devised in the laboratories of the Danish Royal Technical College for testing the permeability of concrete pipe.



Water curing insured tight molding even in pipes of the driest mixes, but water curing becomes unnecessary when sufficient mixing water is used. Pipe of 1:1½ cement mortar proved no better than pipe of 1:2 mix. Coatings of *thin* tar made by hot dipping or cold painting are quickly destroyed by acid. On the other hand, pipes of a 1:5 mix dipped in hot viscous (heavy) tar or asphalt proved equal in acid resistance to uncoated pipes of 1:2 mix. But since the heavy tar and asphalt coatings tend to blister in time, it seems preferable and more economical to use the richer mix and thus avoid the use of an unreliable surface coating.

Supplementary tests of 898 portland cement mortar bars, exposed to the action of lactic, carbonic and hydrochloric acids in concentrations of the order 0:1 to 0:3 normal, showed that it was immaterial whether the first week's curing took place in water or in very damp air, and that the mortar may lose 30 per cent of its strength when thoroughly permeated with water. Crushing strength is reduced much more than flexural strength. Quick-setting and kieselguhr cements showed practically no advantage over portland cement.

Dipping in water glass improved the watertightness of portland cement mortars without, however, increasing their acid resistance. The addition of soap to the mixing water improves watertightness and increases acid resistance slightly, but on the other hand it will cause as much as 33 per cent loss in strength.

It has also been proved experimentally that temperature variations affect the watertightness of mortar principally through the formation or dissolution of gas bubbles in the water. The watertightness of a pipe will apparently decrease at the beginning of a test on account of the expulsion of air from the pores in the pipe shell. A sand column (see Fig. 1b) from which all air had been expelled showed a constant rate of water percolation, while a similar sand column with air-filled pores showed a rate of percolation varying with time and hydraulic head.

The clogging effect of non-corrosive water flowing through filters, pipe walls, dams, etc., which is ascribed to the deposition of solids contained in the flowing water, was investigated by means of the apparatus shown in Fig. 1c. The very porous pipe, made of 1:10 mortar, is surrounded with the watertight jacket, which permits both inward and outward percolation of water through the pipe shell. As long as percolation proceeded continuously in one direction the watertightness of the shell was observed to increase steadily, but every time the direction of percolation was reversed from inward to outward or from outward to inward, the watertightness of the shell would at first decrease until it reached its original value, after which it would increase again.

The Old World's Highest Dam Constructed in France

Long cable tramway handles materials to isolated site—Fissured ledge extended excavation 160 ft. below stream bed—Two miles of grout holes required to seal foundations

PROMINENCE in high-dam construction attained by French engineers in the unusual arch dam (Sautet Dam, *ENR*, Nov. 21, 1935, p. 706) built in the narrow canyon of the Drac River is well maintained in the gravity section designed for the Chambon Dam on the Romanche River in southeastern France. Measured from deepest foundation to crest, the Chambon Dam is the highest outside the United States, being 450 ft. high at maximum cross-section. Like the Sautet Dam with its height of 414 ft., the Chambon Dam is located in a deep but a wider and less precipitous gorge, and it was built for hydro-electric power development. The following information concerning the dam has been abstracted from issues of *Travaux* for July and August, 1935.

Dam structure

Fig. 1 is a sketch plan of the dam, which has a tangent and curve alignment with a controlled spillway on the curve. Fig. 2 shows the dam cross-section at the maximum section, which rises nearly 290 ft. above the streambed; the remaining 160 ft. of its height is in excavation. The maximum thickness is 230 ft., the thickness at the crest is 16.4 ft., and the length along the crest is about 930 ft. The total volume of concrete in the dam is 392,000 cu.yd., and the excavation totaled 150,000 cu.yd. Cyclopean concrete was used with a cement content varying from 253 lb. per cu.yd. to 420 lb. per cu.yd., as shown on Fig. 2. The upstream face was surfaced with gunite and a bituminous waterproofing compound.

The dam section is distinguished by an unusually extensive system of drainage and inspection galleries. There is a large drainage gallery, 8.2 ft. high, extending along the base of the dam from abutment to abutment, also galleries of the same cross-section extending for practically the entire length of the dam at about 143 ft. and 280 ft. below crest elevation, and a transverse gallery of the same dimensions leading from near the upstream to the downstream face, at the latter level. Then there are two more longitudinal drainage galleries, 6.2 ft. high, at about 174 ft. and 260 ft. below crest level, besides a large number of regularly spaced vertical drains, 1 to 2.6 ft. in diameter, totaling over 14,000 ft. in length.

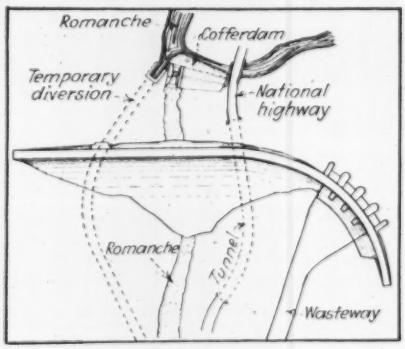


FIG. 1—PLAN of Chambon Dam, river diversion and spillway for hydraulic power development in southwestern France.

The setting and hardening of the mass concrete caused temperatures of more than 120 deg. F., which persisted for months, and contraction joints had to be designed with particular care, since no special provisions were made for cooling the concrete, as was the practice at Boulder Dam. Contraction joints were spaced about 49 ft. apart. Each joint contains a tar-coated welded and riveted strip of annealed electrolytic copper of Z-shaped cross-section, $\frac{1}{8}$ in. thick.

The reservoir outlets consist of: (1)

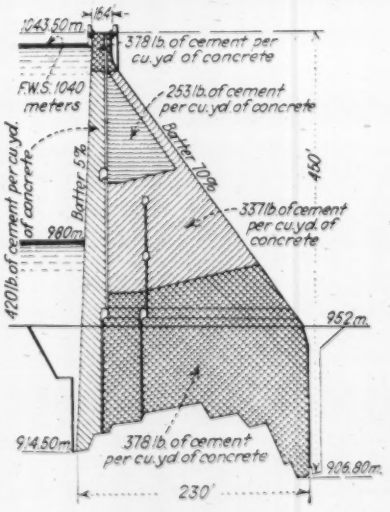


FIG. 2—MAXIMUM SECTION of Chambon Dam, showing richness of concrete in the different parts and the extensive drainage system.

one conduit 7.2 to 6.2 ft in diam[eter] through the body of the dam, opera[ting] under a head of 295 ft. and discharg[ing] 2,825 cu.ft. per second; and (2) a [set] of power-plant conduits, 5.25 ft. in di[am]eter, operating under a head of 230 [ft.] and discharging a total of 3,530 cu[.ft.] per sec.

The spillway, consisting of [four] sluices, two of which are automatic, [has a] discharge 26,500 cu.ft. per sec. from [the] spilling level 18 ft. below the dam cr[est]. It is interesting to note that the st[eel] flume wasteway serving this spillw[ay] was designed for a capacity of on[ly] 14,000 cu.ft. per sec., because it is co[n]sidered less subject to failure than sluic[es] are. Still, even 14,000 cu.ft. per s[ec.] was not considered low for a watersh[ed] of 98 square kilometers, a reservoir [of] 346 acres with a freeboard of 18 ft., an[d] record floods of only 3,000 cu.ft. per s[ec.]

Foundation operation

The distribution of the gneiss, schists and dolomite-limestone formations in the dam foundation is shown by Fig. 3. Preliminary soundings failed to reveal the true nature of the formations, and a situation resulted which was similar to the one that occurred in the construction of the Ontelaunee Dam for the water-works of Reading, Pa. (*ENR*, Sept. 5, 1935, p. 328), only on a much larger scale. Excavation which had been estimated at 65,000 cu.yd. actually amounted to 150,000 cu.yd.

Grouting operations exceeded all expectations; rotary diamond-drill borings, $1\frac{1}{4}$ to 2 in. in diameter, totaled about 10,000 ft. in length, and nearly 900 tons of cement were consumed. The borings averaged 30 to 50 ft., but some reached a depth of 130 and even 160 ft. The lower levels of the gneiss proved to be the most absorptive; one hole in that formation (No. 168, Fig. 3) absorbed nearly 46 tons of cement. The average absorption of cement was about 120 lb. per lin. ft. of hole. Grouting pressures varied from 355 to 570 lb. per sq.in.

The holes were not drilled consecutively, but alternately, thus: drill 1, skip 2 and drill 3, then drill 2 and so obtain a check on the indications of holes 1 and 3. As a rule the holes were not drilled to any predetermined depth but were stopped at some reasonable level, after which they were grouted, then redrilled to a greater depth, grouted again, and so on. Each boring was tested, prior to grouting, by pumping water under pressure into it, for the purpose of obtaining indications as to the quantity and density of the grout required, the pressure and the speed of its injection.

The dam being located in rugged country, with few but much-used mountain roads, cement was transported from the nearest railroad station, at Bourg d'Oisans, by an aerial cable tramway,

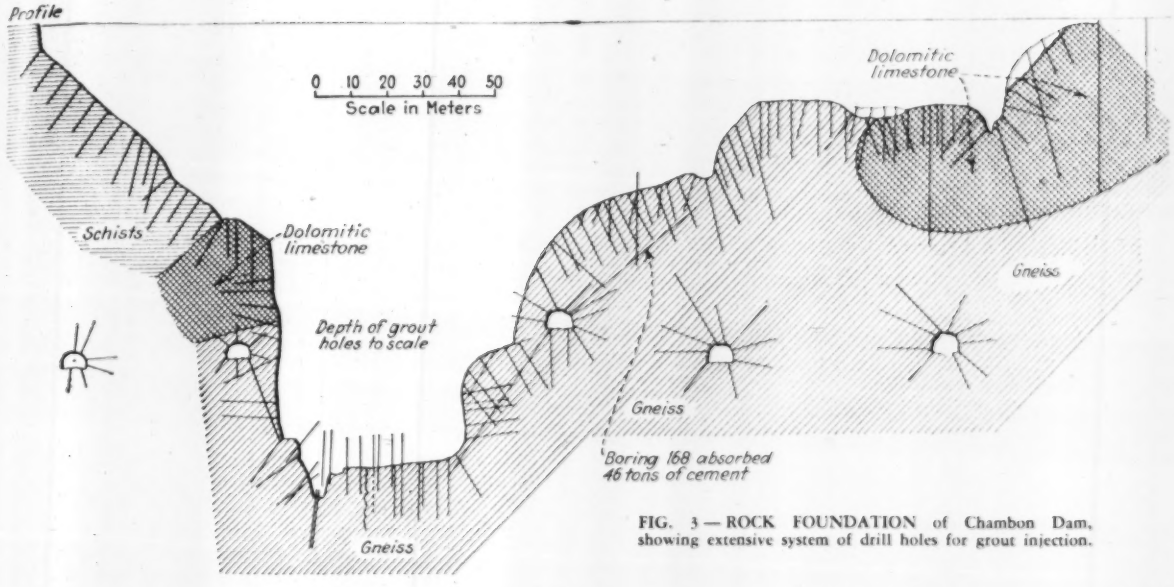


FIG. 3 — ROCK FOUNDATION of Chambon Dam, showing extensive system of drill holes for grout injection.

6½ miles long, installed by Société de Constructions de Voies Aériennes (Transporteurs Etcheverry). The tramway was nearly L-shaped in alignment, its two legs being about 2.6 and 3.8 miles long, and it had a net rise of 1,210 ft., with a summit almost 1,760 ft. above its starting point.

The cable of high-grade steel, 1 in. in diameter and 14 miles long, was carried on 65 steel towers, which were up to 131 ft. in height. The maximum span between towers was 2,880 ft. Covered steel buckets, carrying 5 sacks of cement weighing about 550 lb., were spaced 394 ft. apart and ran at a speed of 6.6 ft. per sec., requiring 110 hp., which gave the line an hourly capacity of 16.5 tons of cement.

Concrete plant

The concrete plant was located on the side of the bluff above the dam crest and at the end of the cable tramway. It consisted of crushers, screens, bins and mixers with connecting conveyors. Concrete was conveyed to the lower parts of the dam by a cable-supported system of chutes and to the upper parts by a cableway spanning the length of the dam. The capacity of the concrete chutes was 40 to 105 cu.yd. per hour, and their grade varied from 45 to 70 per cent. The cableway over the dam site had a span of 1,143 ft., a carrying strength of about 6 tons and an hourly capacity of 40 cu.yd. of concrete.

Plums were to be not less than 44 lb. in weight and were to have not less than 8 in. of mortar around them. No plums were allowed near the upstream face of the dam. The concrete mix was proportioned in accordance with the Bolomey formula (based on Fuller's):

$$P = A + (100 - A)\sqrt{\frac{d}{D}}$$

where P is percentage of aggregates of diameter not exceeding d (in millimeters), D is maximum allowable diameter of aggregate, also in millimeters, and A is a parameter equal to 14, for chuted concrete, and to 12 for concrete deposited by bucket. But concrete so proportioned was not sufficiently plastic, nor unctious (smooth) enough to incorporate plums of considerable size. To make it penetrable to such plums, the mix was modified by increasing the proportion of particles less than 0.5 mm. in diameter (cement included) from 20 to 21 per cent, and the proportion of particles less than 10 mm. in diameter (cement included) from 41 to 44 per cent. The run of aggregates and the concrete were sampled and tested daily.

The power plants served by the reservoir have a total capacity of 100,000 hp. with a yearly output of 65,000,000 kw.-hr. Three small villages were submerged by the water impounded in the reservoir. An important national highway passes over the crest of the dam. It is estimated that the reservoir will retain 130,000 cu.yd. of silt annually. At this rate it will fill up in 500 years.

The project was originally conceived by Henri Fredet, a local industrialist who together with Senator Léon Perrier and C. A. Keller, of the Grenoble Chamber of Commerce, promoted it to a successful conclusion. Messrs. Simon and Haegelen, civil engineers, were in charge of design and construction. The contracting firm was Société Campenon-Bernard, of Paris.

Aluminum Foil Substituted for Lead in Pipe Jointing

OWING to its policy of reducing the use of imported materials to a minimum, the German government has forbidden the use of lead in jointing cast-iron drain pipes by a law dated April 24, 1935. Spurred by necessity, the domestic engineering section of the Verein Deutscher Ingenieure made an investigation of substitutes for lead joints, and according to M. Mengeringhausen, writing in *Gesundheits-Ingenieur* of Sept. 14, 1935, the results achieved with aluminum joints have surpassed all expectations. The aluminum pipe joint now recommended by the domestic engineering section is made of aluminum foil, 0.002 to 0.004 in. thick, which is creased, crumpled and calked into the space between the bell and the spigot. The calking process is as simple as with lead and to a certain extent more convenient, since aluminum is about four times lighter than lead. It has been found that with aluminum foil the 20-mm. (0.8-in.) depth usual in calking with lead can be reduced to 10 mm. (0.4 in.). This is due principally to the greater tensile strength of aluminum, which has three to ten times the strength of lead. With a good yarn packing, aluminum joints of this depth have been known to withstand pressures of about 150 lb. per sq.in. without any leakage. It has also been established that for pipe 2 to 6 in. in diameter the cost of an equivalent aluminum foil joint is practically equal to the cost of the usual lead joint, and possibly 10 per cent less. Pipe joints of molten aluminum are obviously out of the question, since the melting point of aluminum is about twice as high as that of lead, and its heat of fusion is nearly fifteen times greater.

Boulder Dam: Past Construction and Work Yet to Be Done

Accomplishments since construction was begun in 1931 reviewed and the records summarized—Work remaining to be done on the power plant and auxiliaries outlined

By Walker R. Young
Construction Engineer, Central Valley Project, U. S. Bureau of Reclamation
Formerly Construction Engineer, Boulder Dam Project, Boulder City, Nev.

SEVEN YEARS AGO Congress passed the Boulder Canyon Project Act. Less than five years ago Six Companies Inc. signed a contract to build Boulder Canyon Dam for $48,890,995, work that was then expected to take about seven years. When the five-year period is up next March, the dam and power house will be substantially complete, and it is expected that the first generators will be in service.

In the four and one-half years since the work started, this journal has reported upon operations at the dam currently, and at intervals of about a year has devoted the major part of one issue to reporting progress on the work. Because much of the pertinent information concerning the vast quantities of earth, rock, concrete and steel handled during construction is scattered, the editors asked Walker R. Young, the construction engineer, to summarize briefly the major facts relating to construction, and at the same time to indicate the work yet to be done on the penstocks, power house and auxiliaries to complete the present undertaking. This information is given in the following article. —EDITOR.

THE VISION held for so many years of adequate protection of the lands, downstream from Boulder Dam, from floods, silt, and drought, has already materialized in great part, and soon the hum of generators in the power plant will inaugurate a new era of prosperity and development in the Southwest.

Water was first stored back of Boulder Dam on Feb. 1, 1935, and by the following July a sufficient quantity was in the reservoir to supply all downstream irrigation demands for a twelve-month period. In addition, the spring runoff, reaching a maximum discharge above 100,000 sec.-ft., was reduced this season by the gates at Boulder Dam to less than 15,000 sec.-ft., and the discharge could have been entirely stopped if necessary. Reports have also been received of a noticeable reduction in the amount of silt carried by the river below the dam. In this connection, it is of interest to note that the lake is clear for 75 miles upstream and the river for more than 10 miles downstream. The lake waters are an emerald green in the canyons and a deep blue in more open country, while the river below the dam is a sparkling green.

The two principal labor contractors, Six Companies Inc. (which is building the dam, power plant and appurtenant works) and The Babcock and Wilcox Co. (which is furnishing and erecting the penstock and outlet pipes), have not perceptibly slackened the pace of construction since commencing work. Their efficient methods are bringing the project to a successful conclusion approximately two years in advance of the date originally specified.

Today practically all concrete has been poured by Six Companies Inc. for the spillways, intake towers, dam, power house, canyon-wall outlet works, all tunnels, and the upstream plugs in diversion tunnels. Work of this type remaining to be done is principally the filling of temporary galleries in the dam, the anchors and thrust blocks for penstock pipe, filling around machinery in the power plant, the switchyard features, the downstream plug outlet works and the downstream portion of the plug in the Nevada outer diversion tunnel, the upper part of which contains the temporary gates that now regulate the flow from the reservoir. The needle valves and emergency gates in the outlet works are not installed, and some equipment remains to be placed by the contractor in the dam, intake towers and power house.

The Babcock & Wilcox Co. completed fabrication of all penstock and outlet pipe in November, 1935, and all erection is expected to be finished before the end of 1936. The progress of erection to Dec. 1, 1935, is shown on the chart on p. 882.

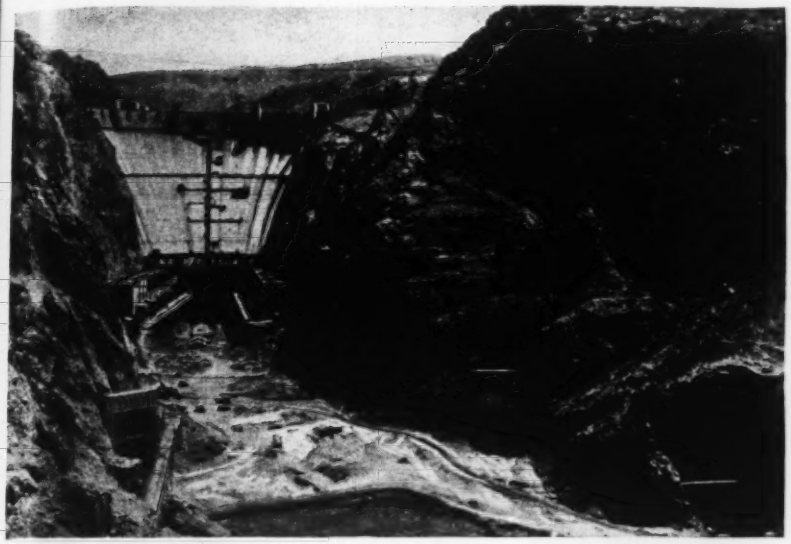
So great have been the changes, it is already somewhat difficult to visualize conditions as they were when work in Black Canyon was started in the spring of 1931. Boulder City was then only on paper, and its site was raw desert. Highways and railroads were being built from trunk lines to the canyon, and a transmission line was under erection to bring construction power from southern California to the project. Down in Black Canyon a muddy swirling stream flowed unrestrained between black precipitous cliffs.

Boulder City a year later had 15 miles of paved streets, possessed public utilities of water, electricity, and sewage disposal, and contained approximately 800 residences and dormitories which housed about 4,000 persons. At the peak of project construction in 1934, it had grown to a thriving community of 1,000 houses and a population of 6,000.

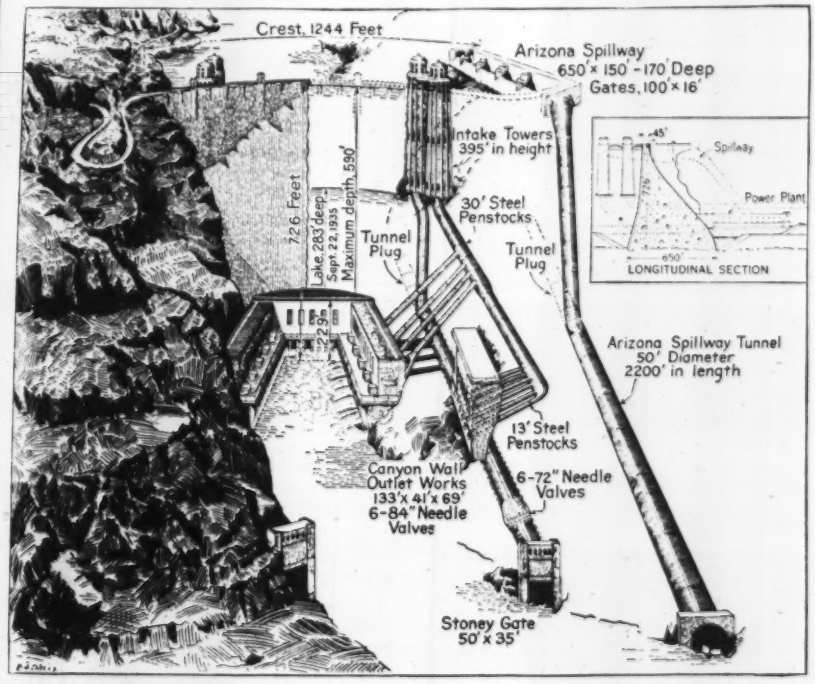
Railroads and highways were completed by the government from Boulder City to Black Canyon rim and extended by Six Companies Inc. to the floor of the canyon and to the contractor's construction plants. More than 28,500 carloads of materials have arrived on the project from factories throughout the nation, including 15,500 of cement, 600 of plate steel, 800 of reinforcing steel, 820 of structural steel, 700 of machinery, 400 of pipe and conduit, 2,900 of lumber and 200 of explosives. In 1934, an average of 35 cars arrived each day. Sand and gravel hauled from screening plant to mixing plants were many times this average, and when the dam construction was at its height, more than 300 cars of materials were placed in the dam every 24 hours.

The highways have successfully withstood the battering of 50-ton trucks, 100- and 150-passenger transports, and the

BOULDER CITY, a paper town in the spring of 1931, was developed within a year into a model community with 800 residences and dormitories housing 4,000 people. At the peak of construction it had 1,000 houses and population of 6,000



WORK ON THE BOULDER PROJECT now is largely concentrated in the area below the dam where the penstocks are being installed within the canyon walls, as shown diagrammatically in the drawing below. Generating equipment is being assembled in the power house.



unending stream of visitors, which numbered 491,082 to Jan. 1, 1935, and 250,000 in the following eight months.

But more pronounced are the changes that have occurred in Black Canyon where even the hue of the rock has been altered by the removal of the 139,000 cu.yd. of rock in stripping operations. There the massive structure of the dam boldly fills the gap between canyon walls. Upstream from the dam the four intake towers rise from cuts in the canyon wall, and on each side of the canyon the large spillways occupy basin-like depressions. Immediately downstream from the dam is the U-shaped power house, and in niches in the cliffs farther downstream are the valve houses of the canyon-wall outlet works. Adit portals are visible at the downstream ends of the power-house wings and a short distance upstream from the canyon-wall valve houses, through which steel pipes are being taken into the penstock tunnels. Down the canyon a few hundred feet the diversion tunnels open into the river channel, the outer Nevada one now carrying the entire discharge from the reservoir.

The building of the dam and its related features have been described in previous issues of *Engineering News-Record*, and in the following paragraphs the program of construction and the work accomplished will be reviewed briefly.

Start of work

Blasts for the first excavations for diversion tunnels were fired at the portals of 10x12-ft. construction adits on May 16, 1931. A year later almost to the day, the four 56-ft.-diam. bores for carrying water around the dam site had been driven for their combined lengths of 15,946 ft., requiring the removal of 1,500,000 cu.yd. of rock. During this work, sixteen 12x12-ft. pilot headings were being driven at one time, and later excavation was in progress from eight 41x56-ft. headings. Tunnels of this latter section were excavated for a combined length of 6,848 ft. during the month of January, 1932, removing 454,335 cu.yd. of rock. An average blasting round broke 1,000 cu.yd. of rock and advanced the heading 17 ft.

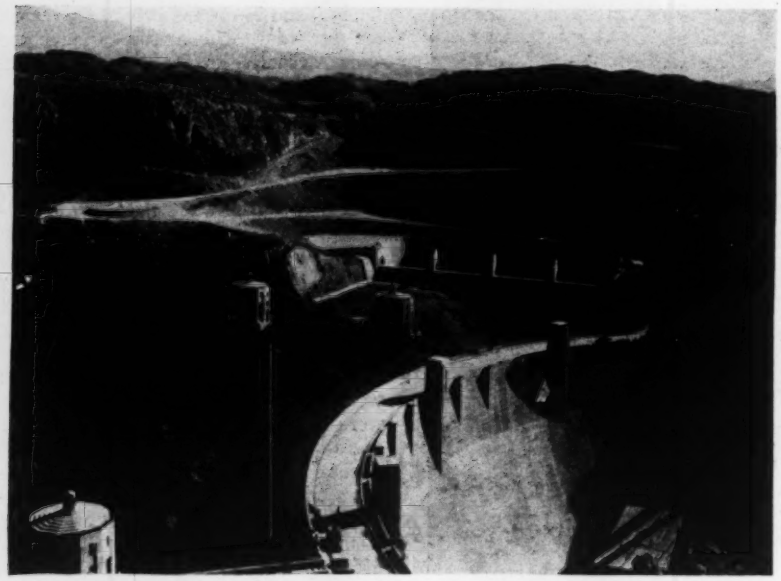
Lining the tunnels with a 3-ft. thickness of concrete was started March 16, 1932, and completed a year later, except the pours at plug sections. More than 300,000 cu.yd. of concrete were placed in these operations. Steel forms were used, an 80-ft. length of side-wall form weighing 250 tons. The river was first diverted (through the two Arizona tunnels) on Nov. 13, 1932, when temporary dams were thrown across the stream.

Cofferdams

Attention was next directed to the cofferdams, which were built to turn the river flow into the diversion tunnels and to keep the dam site dry while the dam and power plant were built. The 514,616 cu.yd. of earthfill, 108,156 cu.yd. of rock, and 2,394 cu.yd. of concrete paving for the upper cofferdam were placed in a period of four months, beginning on Oct. 31, 1932. The 200,711 cu.yd. of earthfill and 41,048 cu.yd. of rock blanket for the lower cofferdam, and the 94,248 cu.yd. of rockfill in the rock barrier downstream from the lower cofferdam were also placed in four months. The upper cofferdam was 480 ft. long, 750 ft. thick at the base, and 98 ft. high; the lower cofferdam was 350 ft. long, 550 ft. thick at the base, and 66 ft. high; and the rock barrier was 375 ft. long, 200 ft. thick at the base and 54 ft. high. The crest width of the upper cofferdam was 70 ft., and each of the downstream structures was 50 ft.

A fleet of nearly 150 trucks, some equipped with 16-cu.yd. aluminum bodies, was used for hauling fill materials, and bills for gasoline in one month amounted to $45,000 and for tires $15,000.

As much as 20,000 cu.yd. of earthfill were placed in the upper cofferdam in 24 hours, and all three of the diversion dams were ready to turn the river flow by April 1, 1933. The diver-



THE BLACK CANYON HIGHWAY crosses the canyon on top of the dam and, after passing over the Arizona spillway channel, climbs out of the canyon by a winding road. This route from Boulder City, Nev., to Kingman, Ariz., was opened to traffic on Dec. 11.

sion works were designed to divert 200,000 sec.-ft. of water safely (the maximum recorded in Black Canyon) around the dam site, although the largest flow when they were in use was 79,000 sec.-ft., which occurred June 7, 1933.

In the meantime, excavation had gone forward for most features of construction. Channels were cut for the spillways at the two sites upstream from the dam and immediately above the outer diversion tunnels, taking out 601,419 cu.yd. of rock by dynamite, power shovel and trucks in the period from February, 1932, to March, 1933. The cuts were approximately 650 ft. long, 150 ft. wide, and 170 ft. in maximum depth.

TABLE I—SIGNIFICANT ELEVATIONS AT BOULDER DAM AND POWER HOUSE

Feature		Elev.
Diversion tunnels	Center of invert-upstream portals;	640
	Center of invert-down-stream portals	626
Upstream cofferdam	Crest	720
Downstream cofferdam	Crest	690
Rock barrier	Crest	683
Spillways	Permanent crest	1,205.4
	Crest of drum gate (raised)	1,221.4
	Channel cross-weir	1,145.0
	Low-point channel	1,109.3
Dam	Base	505.6
	Crest (center of roadway)	1,232.2
	Top of parapet walls	1,236.0
Intake towers	Lower gates (center line)	900.0
	Upper gates (center line)	1,050.0
	Hoist-house floor	1,232.3
	Extreme top of tower	1,289.0
Power house	Lowest foundation	550.0
	Center line of turbine	637.0
	Generator floor	673.0
	Tailrace water-surface, max.	666.0
	Tailrace water-surface, normal	647.0
	Tailrace water-surface, min.	625.0
Valve houses	Center line of valves	820.0
	Operating floor	834.6
Reservoir	Water surface for 30,500,000 ac.-ft.	1,229.0

Four huge rock grooves for the intake towers were blasted from canyon walls down to benches 260 ft. above the river channel between February, 1932, and March, 1933, removing 358,743 cu. yd. of rock. The cuts are 110 ft. across at the base, and those on the Nevada side are 340 ft. deep.

Foundation excavation

Excavations in the river channel were started shortly after the first diversion of the river in November, 1932, and continued throughout 1933. In this time 411,966 cu.yd. of river fill—mostly sand, silt and gravel—were taken out at the cofferdam and rock barrier sites, 623,145 for the dam, and 291,708 for the power house. Excavations in cuts in the canyon walls for the dam abutments, back walls of the power house, and the benches at the canyon-wall outlet works were in progress from December, 1932, to December, 1933, blasting down approximately 430,000 cu.yd. of rock. High scaling methods were used for all of this work.

Driving the inclined shafts to spillways, the raises to intake towers, construction adits, plug adits, the penstock and outlet system of tunnels, the passageways from power house to penstock tunnels, elevator shafts, drainage tunnels, and miscellaneous tunnels and shafts, was carried on from January, 1932, to January, 1934. Approximately 445,000 cu.yd. of rock were removed in driving these 91 tunnels and shafts, the excavated cross-sectional dimensions of which ranged from 90x103 ft. at the portal of the Arizona spillway shaft to 4.5x8.5 ft. in the penstock passageways. These include the four 26x43-ft. construction adits, the two 41-ft.-diameter penstock header tunnels and two raises to intake towers from diversion tunnels, the 21-ft.-diameter penstock tunnels, 11-ft. horseshoe-shaped conduits to canyon-wall valve houses, 10.5x12.5-ft. adits to downstream plugs, and the 56-ft.-diameter spillway incline shafts, which widen at their upper portals to the maximum dimension previously mentioned.

Excavation now practically complete

Practically all excavation on the project has now been completed, the total material removed being in excess of 7,950,000 cu.yd. The first concrete was placed in the dam on June 6, 1933, 3,000,000 yd. were in place eighteen months later, and all blocks had been brought up to crest elevation on March 23, 1935. Parapets, utility towers and elevator towers were erected in the following three months, bringing the total concrete placed in the structure to 3,250,335 cu.yd. As has been mentioned many times before, the dam is of the arch-gravity type, its height from lowest concrete to center of roadway on the crest is 726.6 ft. and another 3.8 ft. to top of parapets, its base thickness is 650 ft., crest thickness 45 ft. and crest length 1,282 ft.

Artificial cooling

Artificial cooling of the dam was begun in August of 1933 and was completed in March, 1935. A maximum concrete temperature of 138 deg. F. was attained, as indicated by embedded resistance thermometers, and some portions of the dam were cooled to as low as 43 deg. F. The total length of cooling pipe installed in the dam is 582 miles and grout pipe 180 miles. Grouting of contraction joints was in progress from May 24, 1934, to June 7, 1935, in which time 33,477 sacks of cement were

TABLE II—CHRONOLOGICAL TABLE OF CONSTRUCTION OPERATIONS AT BOULDER DAM

Feature	Excavation		Concrete	
	Commenced	Completed	Commenced	Completed
Diversion tunnels	June, 1931	May, 1932	Mar., 1932	Mar., 1933
Upstream plugs			Mar., 1934	May, 1935*
Downstream plugs	Jan., 1934	Apr., 1935	Aug., 1935	
Cofferdams	Sept., 1932	Mar., 1933	Oct., 1932	Feb., 1933†
Spillways	Feb., 1932	Mar., 1933	Mar., 1933	Mar., 1935
Dam	Oct., 1932	June, 1933	June, 1933	Mar., 1935
Intake towers	Feb., 1932	Mar., 1933	Dec., 1933	Mar., 1935
Penstock system	Dec., 1932	Oct., 1933	Sept., 1933	Aug., 1934
Power house	Dec., 1932	Mar., 1934	Jan., 1934	
Valve houses	Nov., 1932	Mar., 1934	Jan., 1935	Aug., 1935

*Except completion of No. 1 plug.
†Dates under excavation also include cofferdam fill.

HIGH ON THE CANYON WALL below the power house are the outlet works. This view, taken from within the generator room of the Arizona wing of the power house, shows the valve house on the Arizona side.

WATER STORED behind Boulder Dam this season rose to well above the bottom of the intake towers, but drafts to supply irrigation demands downstream have lowered the lake somewhat. This picture is from the Arizona side.

placed. Later core-drilling across the joints showed these to be well filled.

Outlet facilities

Spillway channel walls were lined with an 18-in. thickness of reinforced concrete, and the floors are 24-in. thick with 12-in. of porous concrete below. The weirs are formed of mass concrete whose maximum dimensions are approximately 90 ft. through at the base and 85 ft. high, with gate piers rising another 36 ft. Four structural-steel drum gates, weighing 500,000 lb. each, were erected on each weir. These gates are buoyant vessels, are hinged on the reservoir side of the weir, and ordinarily rest in recesses in the weir but can be raised to a height of 16 ft. above the permanent crest of the weir. Concrete placed for the spillway channels and weirs amounted to 128,000 cu.yd., most of which was placed between March, 1933, and January, 1935. Lining of the 600-ft.-long inclined shafts which will carry the reservoir overflow from spillway channels to outer diversion tunnels, with a 3-ft. thickness of concrete, was recently completed. Approximately 28,500 cu.yd. were placed in this work.

Concrete for the intake towers was first placed in the Nevada downstream tower on Nov. 4, 1933, and soon was being poured for all four structures. The towers are essentially hollow cylinders of 29-ft. 8-in. inside diameter and 338-ft. height, surmounted by a hoist house and lantern rising another 57 ft. The outside diameter of the towers is 82 ft. at the base and 63 ft. 3 in. at the hoist-house floor. Concrete placed in the towers has amounted to 93,674 cu. yd., and reinforcing steel totals 15,299,604 lb. Each tower is equipped with a 32-ft.-diameter, 10-ft.-high steel cylindrical gate at the tower base and a second similar gate 150 ft. higher, as well as steel trashracks which extend from the base nearly to the hoist-house floor in twelve bays around the tower. The gates are raised and lowered by hoists in the tops of the towers, allowing water to enter or shutting off water from the 30-ft.-diameter penstock headers that connect to the tower bases. The total weight of the eight gates and hoists is approximately 5,892,000 lb., and of the trashracks 7,024,000 lb.

The 41-ft. section of the two upper header tunnels and the raises from inner diversion tunnels to upstream intake towers were first lined with a 24-in. thickness of concrete and the raises to all four intake towers later were filled with concrete between the 30-ft. pipe and the concrete lining. The sixteen penstock tunnels, of 21-ft.-diameter excavated section, were lined with 18 in. of concrete. Outlet tunnels between the header tunnels and the canyon-wall outlet works were filled with concrete between the 8½-ft.-diameter steel conduits and the rock of the tunnel walls. Concrete anchors and thrust blocks are being placed in suitable locations and when completed, concrete poured for the penstock system of tunnels will amount to 80,000 cu.yd., exclusive of the linings of the inner diversion tunnels.

Valve houses

Valve houses for the canyon-wall outlet works are nearing completion. These structures are 133 ft. long, 69 ft. high and 41 ft. in average width. The upper slab of the valve-house roof consists of a grillage of railroad rails embedded in concrete. Installation of the twelve 84-in. needle valves and paradox gates just back of them has been finished. The elevator shafts, from the downstream plug adits, have been lined, and the elevators are being installed. Concrete poured for the valve houses has amounted to 18,000 cu.yd., placed in about six months.

Adits to the downstream plugs have been lined with concrete 12 in. thick, requiring 1,867 cu.yd., but concreting has only started for the downstream tunnel plugs. These last-mentioned features will contain the twelve 72-in. needle valves and paradox gates to be used for outlets for the penstock headers in the inner diversion tunnels.

Upstream plugs in the two inner diversion tunnels, which are located immediately upstream from the raises to upstream intake towers, were placed in the period from March to November, 1934. Each of these is 250 ft. long and contains approximately 25,000 cu.yd. of concrete.

The upper 214-ft. section of the plug in the Nevada outer tunnel was built in December, 1934, and January, 1935. It contains the four pairs of 6½x 7-ft. slide gates which now control the flow of water around the dam. The lower portion of the plug, 179 ft. in length, will be placed after water can be diverted from the reservoir through the Nevada downstream intake tower and the needle valves of the Nevada Canyon wall outlet works, when the slide gates in the tunnel plug will be permanently closed and the four water passages filled with concrete and grouted.

The plug in the Arizona outer tunnel, which, like the plug mentioned in the preceding paragraph, is situated immediately upstream from the spillway inclined shaft, was built in April and May of 1935. Its length is 393 ft., and it contains 33,160 cu.yd. of concrete, the same quantity as will be placed in the Nevada spillway plug.

All tunnels previously mentioned have been grouted at pressures varying from 50 to 1,000 lb. per sq.in., to depths ranging from that required to penetrate the

concrete lining to 170 ft. This grouting required 235,954 sacks of cement.

Power house

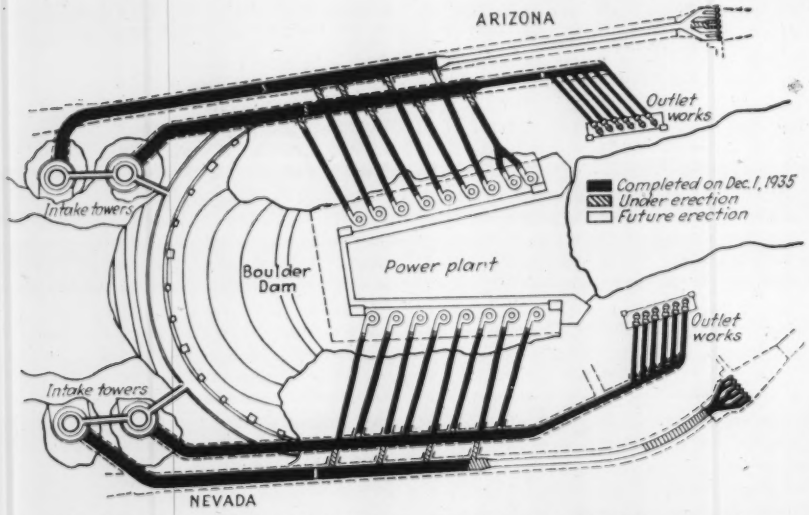
Most of the concrete has been poured for the power house with the exception of that to be placed following the installation of machinery. This U-shaped structure has a height of 229 ft. from lowest concrete to top of highest parapet, is 1,650 ft. in length around the U next to the dam and cliffs, is 150 ft. wide at the generator floor in each wing, and has a maximum width of 157 ft. across the central portion in an up and downstream direction. The roof is 4½ ft. thick, covers an area of four acres, and is made up of seven laminations, two of these being reinforced concrete, another asphalt paving and others of sand and gravel. Beneath the roof are about ten acres of floors. Access to the power house will be gained by way of elevators and galleries through the dam or by the lower portals road, and a tunnel 1,974 ft. long to the downstream end of the Nevada wing. Concrete to be placed in the power house will amount to approximately 240,000 cu.yd.

The total quantity of concrete poured to Dec. 1, 1935, was approximately 4,500,000 cu.yd., and it is expected that another 50,000 cu.yd. will be placed before the project is completed. Sand, gravel and cobbles for the concrete were secured from pits 10 miles upstream from the dam and hauled to the screening plant in Hemenway Wash. Processed aggregates were transported to storage piles or direct to the mixing plants. Cars loaded out from the pit numbered 143,244, containing approximately 9,000,000 tons of raw aggregates, and cars of finished aggregates from the screening plant amounted to 145,497, or a total of about 7,700,000 tons. Processing records set by the screening plant, which was operated from Feb. 6, 1932, to Nov. 29, 1934, were 6,850 tons in eight hours, 18,590 in one day, and 500,300 in one month.

Cement was brought to the project in bulk, as many as 35 cars being received in one day and 973 in one month. The total cement received to Sept. 1, 1935, was 5,000,000 bbl. From July 7, 1933, all cement passed through a blending plant, the barrels blended to December, 1935, amounting to 4,222,775. Cement is received simultaneously from as many as five manufacturing plants.

Concrete was mixed in two plants, the Lo-Mix situated at the elevation of the upper cofferdam crest 4,000 ft. upstream from the main dam structure, and the Hi-Mix located near the Nevada canyon rim, 650 ft. downstream from the dam abutment. The Lo-Mix plant contained four 4-yd. mixers, and in the period of its operation from Feb. [illegible] 1932, to Nov. 2, 1934, produced 2,097 [illegible] cu.yd. of concrete. Hi-Mix was equip[illegible] with as many as six 4-yd. mixers, [illegible] placed in operation March 1, 1933, [illegible] on Dec. 1, 1935, had mixed 2,333,[illegible] cu.yd. of concrete. Record runs [illegible] the plants were 2,462 cu.yd. in eig[illegible] hours at Lo-Mix, 3,001 in the sa[illegible] period at Hi-Mix, and 3,534 cu.yd. fr[illegible] both plants. The record placement [illegible] concrete for one month was 261,8[illegible] cu.yd. in March, 1934.

Transportation of concrete was [illegible] truck, train, dragline, derrick and cabl[illegible] way. The record transportation by o[illegible] cableway on one shift was 277 bucket[illegible] containing 2,200 cu.yd. of concret[illegible] which were placed in the dam on De[illegible] 30, 1934. Other materials than concrete[illegible] which have been placed in construction[illegible] on the project include 840 miles of pipe, 45,000,000 lb. of reinforcement steel, and 12,000,000 lb. of structural steel.



PENSTOCK ERECTION PROGRESS CHART, indicating that this part of the work on the penstocks to be installed under the present contract is well along toward completion.

Black Canyon Highway

Work now in progress under the contract with Six Companies, Inc., includes the building of the Black Canyon Highway and its Arizona extension, the spillway surface drainage features, the high-tension switchyard, the powerhouse roadway tunnel, and the adits to the stoney gates at the diversion tunnel outlets.

The Black Canyon Highway is that part of the road between Boulder City, Nev., and Chloride, Ariz., which extends 3,160 ft. from the Nevada abutment and 4,140 ft. from the Arizona abutment, crossing Black Canyon on the dam crest and the Arizona spillway by a concrete arch bridge. The high-tension switchyard is situated 500 ft. east of the substation of the Nevada-California Power Co., which furnished power for project construction. Circuits for

A BRANCH SECTION OF PENSTOCK, 30- to 13-ft. diameter, mounted on the trailer by which the sections are brought down under the main cableway.

control of switchyard equipment from the power house are located in a tunnel, which has been driven upward from the power house through the Nevada Canyon wall to a point 200 ft. south of the substation, and thence in an 8x10-ft. concrete conduit to the switchyard.

The power-house roadway tunnel has been driven from the compressor station (on the lower portals road) above the Nevada diversion tunnels and beneath the Nevada valve house to the downstream end of the Nevada wing of the power house.

Penstocks and power plant

Fabrication and erection of plate-steel penstock and outlet pipes are going forward rapidly under the contract with Babcock and Wilcox Co. On Dec. 1, 1935, approximately 41,000 tons had been fabricated, 36,500 tons hauled by train or 200-ton trailer and then lowered by 200-ton cableway to the construction adit portals, and 33,000 tons had been installed of the total of 41,000 tons that will be placed.

Installation of power-plant machinery has been started by government forces, all of the draft tubes for four 115,000-hp. units have been placed, and turbine erection is in progress. According to present plans, the first power will be generated in the spring or summer of 1936. Four 115,000-hp. units, one of 55,000 hp. and two of 3,500 hp., are being installed at this time. Installation of two additional units of 115,000 hp. each will be started in 1936. When all units are in place, there will be fifteen 115,000 hp. units, two of 55,000 hp. and two of 3,500 hp., or a total capacity of 1,842,000 hp. The 115,000 and 55,000-hp. units are of vertical-shaft reaction type, and the two smaller units are of the horizontal-shaft impulse type.

Control surveys

Surveys establishing a system of vertical and horizontal control were made recently by the U. S. Coast and Geodetic Survey of an area within a 50-mile radius of the dam. These surveys will be repeated at intervals to determine the amount of settlement caused by the weight of water in the reservoir. Uplift pressures, stress in the rock near the dam and movements of the dam, due to temperature variations and pressures set up by the reservoir, are also being studied by engineers of the Bureau of Reclamation.

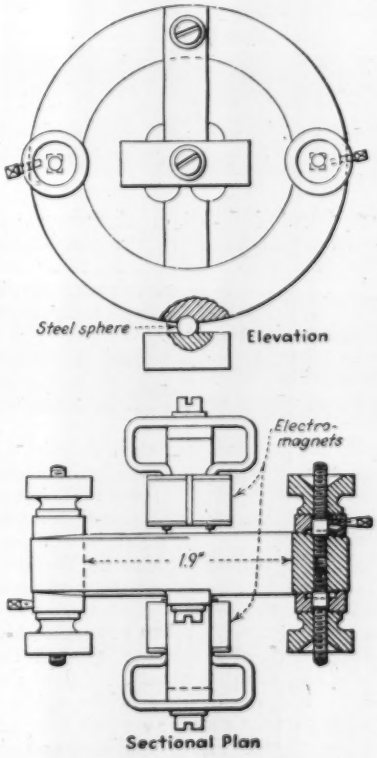
The Boulder Canyon project is being built by the Bureau of Reclamation, of which Commissioner Elwood Mead is administrative head; R. F. Walter is chief engineer, S. O. Harper assistant chief engineer, J. L. Savage chief designing engineer, and L. N. McClellan chief electrical engineer. The author served as construction engineer on the project until his recent transfer to the Central Valley project in California. Ralph Lowry is now construction engineer.

The contract with Six Companies Inc., was signed March 11, 1931; notice to proceed with construction was acknowledged on April 20, 1931, and final date of completion was specified as April 28, 1938. The contract with the Babcock and Wilcox Co. was signed July 9, 1932; notice to proceed with construction was acknowledged on Aug. 11, 1932, and completion date is Jan. 7, 1938.

Pressure of Loess Soils Tested With Proving Rings

WORKING VALUES for lateral thrust on walls retaining loess soils have been determined by Russian engineers using an ingenious form of proving ring to measure pressures. These soils, a very fine sand loam, are of frequent occurrence in Mississippi Valley states, and they present special problems when subject to water erosion. The Russian tests, however, were directed particularly to the study of retaining-wall loads, as they are reported by Prof. N. N. Davidenkov in *Izvestiya Nauchno Iseledovatelskovo Instituta*, Vol. 14, 1934.

According to two series of laboratory tests, one of them on a large scale, these conclusions seem justified: (1) the lateral thrust of backfill against a retaining wall is due to the weight of the loam and to residual stresses induced by tamping; (2) the thrust is at a maximum immediately after tamping, which is followed by a period of relaxation lasting several days, during which the pressure decreases very considerably (as much as 50 per cent or even more), and quite abruptly at first; (3) the point of application of the resultant thrust may be raised by heavy tamping to above the mid-height of the wall, but as relaxation proceeds it will move downward.



PROVING RING for measuring pressures in Russian tests of wall loads of loess soils.

It is therefore recommended that during the unstable period before relaxation a retaining wall should withstand, *with a low factor of safety*, a thrust equal to 30 per cent of the vertical pressure, applied at one-third of its height, plus 92 lb. per sq.ft. distributed uniformly over the entire wall, and no live load. To meet stable conditions after the period of relaxation, the wall must retain, *with an ample factor of safety*, a horizontal thrust equal to 30 per cent of the vertical earth pressure plus 30 per cent of the live load.

In the large-scale test, thrust was measured with original dynamometers reminiscent of the proving rings described by C. M. Spofford and C. H. Gibbons in *Engineering News-Record*, March 28, 1935, p. 446. As seen by the illustration, the Davidenkov proving ring, having an inner diameter of 1.9 in. and an outer of 2.8 in., carries two thin wires set to vibrate with an original frequency of 1,300 vibrations per second. Two electro-magnets set over the center of the ring carry an electric current that can be varied to match the period of vibration of the wires, thus producing resonance. As the ring is loaded, its diameter decreases and the span of the wires and their pitch undergo a change. This change in pitch, which is plainly audible, serves to indicate the magnitude of the load on the ring. The capacity of the ring is 1,100 lb. with a corresponding deformation of 0.0024 in.

Thrust in the soil cylinders, used in the small-scale tests, was determined from the deflection of thin strips of the cylinder wall. These strips, six to each cylinder, were formed by making two parallel fine slits in the wall of the cylinder, 1.6 in. long, spaced 0.12 in. apart. The deflection of the strips was also measured acoustically, by means of a string and electromagnet combination.

Detachable and Forged Drill Bits Compared by TVA

Five months' comparison tests at Norris Dam quarry indicate removable bits are more economical under conditions encountered there, due mainly to faster drilling speeds

TO OBTAIN a comparison of costs and operating performance between detachable and forged drill bits in rock-drilling, the Tennessee Valley Authority last winter and spring conducted a series of tests at the quarry for Norris Dam. The tests covered complete quarry operations for five months and were supervised by special inspectors who observed and recorded the costs and performance characteristics of the drill steel. During the first month the forged bits, regular equipment on the job, were used; in each of the succeeding three months all drills were equipped with one of three makes of detachable bits. For the fifth-month test forged bits were again used, but under more favorable drilling conditions than prevailed during the four preceding tests. The test results indicate that for large quarry operations under conditions obtaining at Norris Dam, the detachable bits are cheaper, largely because their harder and sharper cutting edges result in faster drilling, and because of the saving in steel-handling costs.

The following data are extracted from a report prepared by A. J. Ackerman, construction plant engineer, Tennessee Valley Authority, covering the five test runs.

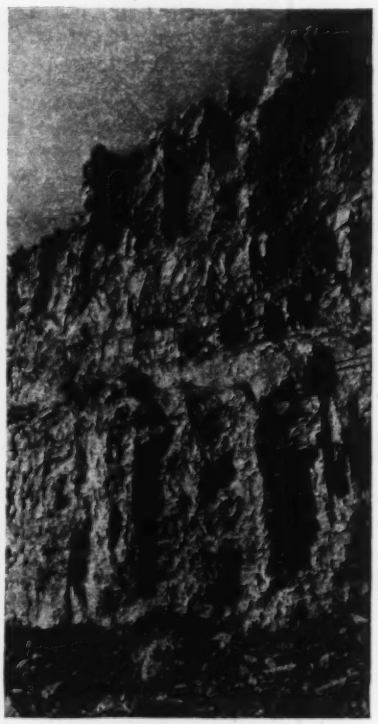


FIG. 1—TYPICAL quarry face at Norris Dam where five one-month test runs of forged and detachable bits were carried on.

Quarry and drilling conditions

The quarry at Norris Dam was benched into a steep hillside. Quarrying operations were carried on along a 1,000-ft. face, which during the tests ranged from 60 to 80 ft. in height. The rock was a silicious dolomite, between trap and sandstone in toughness. Its abrasive qualities were lower than those of granite or trap, but above most limestone, dolomites, slates and shales.

Quarrying was by the bench method. One, two or three rows of holes were drilled parallel to the face on 6x8-ft. spacing, and sufficient powder was used to throw the blasted rock clear of the face of the newly-formed bench. Drilling 10 ft. per bit was possible, permitting the use of 10-ft., 20-ft. and 30-ft. steel of 1¼-in. hollow-round rods. Quarrying operations were conducted 22 hours per day, six days a week.

Thirteen wagon-mounted drills of four standard makes were used indiscriminately during the tests, four or five being in service at one time. Shop equipment included a sharpener, oil furnace and shank grinder. Air supply was from a 6-in. header, which divided into 2-in. and 4-in. feeder lines. Drills were connected to the feeders by 50-ft. lengths of 1-in. hose. Several checks of air pressure at the drills and at the header line, where it entered the quarry, showed not more than 2-lb. difference in pressure.

The usual crew for each shift on the detachable bit tests consisted of: one blacksmith and helper, one drill operator and helper per drill, one nipper, two cribbers, a drill foreman and a water boy. For the forged bit runs the same personnel was used, plus an additional helper in the shop, another nipper and a truck or team. When removable bits were used, one man transported the used and sharp bits between shop and drills, and the driller's helper changed the bits on the rods. Two men were required for collecting and loading used forged steel, transporting it to and unloading at the shop, and loading, transporting and distributing fresh steel. [illegible] the high quarry faces three or four [illegible] ditional men were required to carry [illegible] steel up to the drills.

In making the tests each type of [illegible] was used exclusively for one mon[illegible] Daily records were compiled and la[illegible] reduced to a final summary represe[illegible] ing average conditions of the ma[illegible] variables that occur in the quarryi[illegible] operations. All holes were measur[illegible] when completed, but no record was o[illegible] tained of the footage of holes part[illegible] drilled and abandoned when the ste[illegible] broke or stuck. Holes nearly complete[illegible] at the time of breakage of a bit wer[illegible] usually loaded and fired.

An important difference should b[illegible] noted in respect to gages used on th[illegible] forged and removable bits. The gag[illegible] of the forged bits was 2½ in. on the 10[illegible] ft. steel, 2¼ in. on the 20-ft., and 2 in[illegible] on the 30-ft. The same gages were used for detachable bits during the first two weeks; for the following ten weeks thereafter a ⅛-in. differential in gage was used (sizes 2¼, 2⅜, 2 in. for six weeks, and 2½, 2⅜, 2¼ in. for the last four weeks).

Unavoidable variations included changes in drill crew personnel, rock and drilling conditions, air pressure, time required for moving and cribbing up of wagon drills, distance from shop to drills, number of rods available for removable bits, and experience of the drilling and sharpening crews in the use of detachable bits.

While the tests were conducted in such manner as to provide as true a comparison as possible, the variations stated above naturally affected the results to a certain extent. The inexperience of the crews during the first part of the detachable-bit runs was a handicap to this type of drill steel. Because the tests were conducted under similar drilling and rock conditions, results at the first forged bit runs and those of the removable units are fairly comparable; a switch from the quarry bench to the solid rock floor for the second solid bit test introduced drilling factors not comparable with those prevailing on the other tests.

Results of the test are summarized in the accompanying table. The three runs on detachable bits are treated as one test in order to give a direct comparison between the removable and forged bits.

Forged-bit tests

Two of the five monthly runs were on conventional forged bits. A comparison of results of these two runs reveals variations as wide as those between forged and detachable bits. These are largely attributed to differ-

ences in drilling and rock conditions, but they indicate the difficulty in conducting a drilling test under truly comparable conditions. The first test was conducted on the quarry bench, while operations for the second forged bit test were transferred to the floor of the quarry to remove a 30-ft. layer of rock. Here nipping of drill steel was reduced to a minimum, handling expense was low, and steel was easily changed before becoming too dull.

On the first run the cost of transporting the steel between shop and drills, up and down the steep quarry face, and handling at the sharpener was a large item. In the last, drills were handled on the level floor, the shop was much nearer the point of operations, the steels were changed more often, and hence the rate of drilling was better.

In the first test, the number of stuck steels was high. The principal cause of sticking was found to be a failure to enlarge the blow hole sufficiently during sharpening operations, thereby reducing the air supply for blowing out cuttings. Sticking was also caused by unequal hardening of the bits, resulting in excessive gage wear. Breakage of shanks and steel was considered normal.

In the second test, sticking of bits and steel breakage was much lower, attributed to a harder rock containing fewer loose seams.

Little breakage of the bits of the forged units occurred in either test. Bits were sharpened without any mechanical control of heating or tempering. Considering that the removable bits were all heat-treated by scientific methods, the breakage and wearing qualities of the forged bits were regarded as very satisfactory.

Detachable-bit tests

The tests on the three makes of detachable bits were made over a period of three successive months, one make of bit being used exclusively over the entire quarry for one month. (In the following discussion the detachable tests will be referred to as 2, 3 and 4). All operations were completely converted in one day to the use of the removable bit.

As there was no advance training of the crews, the first test undoubtedly suffered through lack of experience of the men and through the two-weeks' use of $\frac{1}{4}$-in. differential in bit gages, later changed to $\frac{1}{8}$-in.

Rod Performance—At the start of test 2, there were 30 rods prepared, but excessive steel and thread breakage due to continuous hard performance required the number to be increased eventually to 62. Had more rods been available at first, the high rod breakage might have been reduced because of lower fatigue stresses. For test 3, there were 81 rods prepared, resulting in better

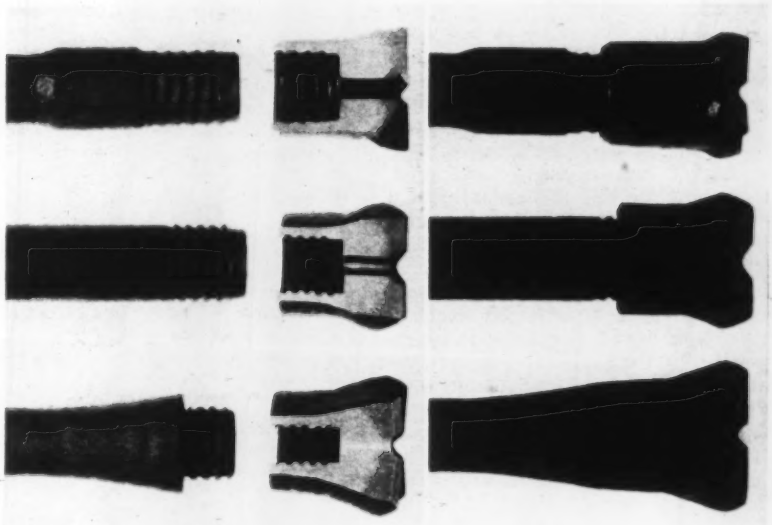


FIG. 2—THREE TYPES of detachable bits upon which the Norris Dam tests were made, shown in cut-away section and in assembled form. In the two upper types the end of the rod bears against the bottom of the socket in the bit; in the lower type the bit bears against a shoulder on the rod.

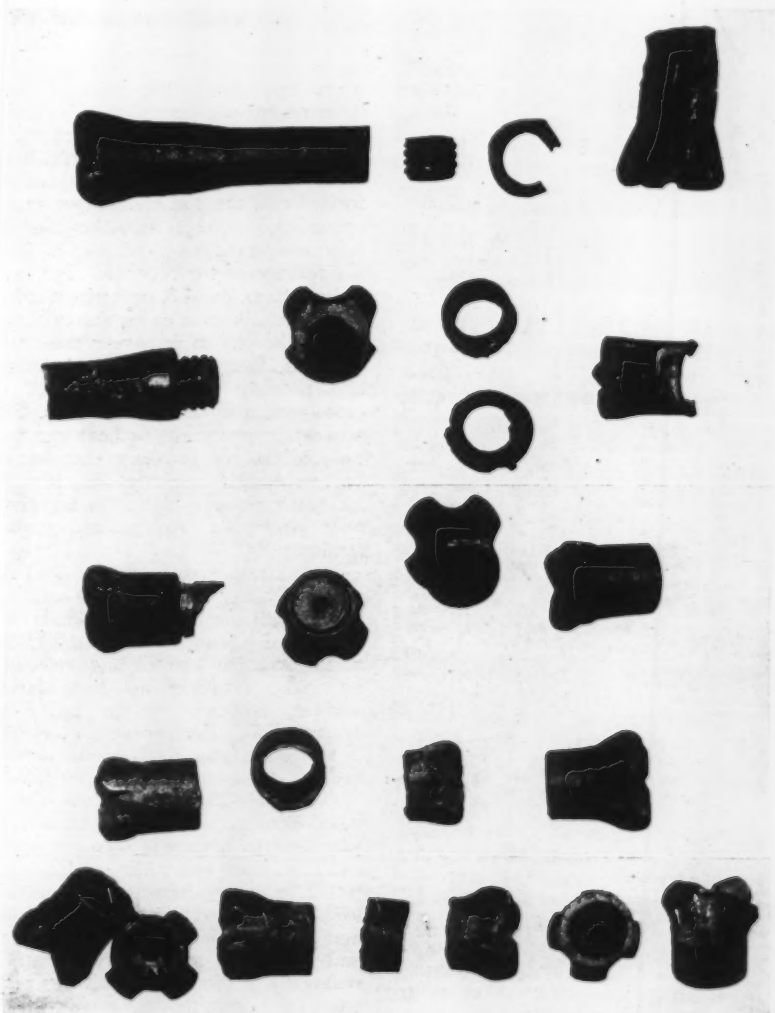


FIG. 3—CHARACTERISTIC BREAKAGES of the detachable bits.

performance. Based upon this experience, 94 were made ready for test 4.

The three types of removable bits used different types of thread on the end of the rod. One type required upsetting the end of the rod in preparation of the threads, which proved to be a difficult and expensive operation. Equipment for this process included a forge, sharpening machine and a lathe, and, as the lathe shop at Norris Dam is a mile away from the sharpening shop, steel transportation costs were high. Another type of bit required a lathe-cut thread, also found to be expensive to form. A forging process was developed to replace the lathe work, which proved to be much more satisfactory, for the threads could be formed in the drill shop, and the forging of the steel seemed to reduce rod breakage through the thread. However, both a forge and sharpening machine were required for the operation.

PERFORMANCE AND COST DATA—NORRIS DAM DRILL-BIT TESTS

Type of Bit	Test 1 Forged (1st Run)	Tests 2, 3 and 4 Detachable	Test 5 Forged (2d Run)
Summary of Work and Time			
1. Rock excav., cu.yd.	57,647	217,273	81,392
2. Lin.ft. holes drilled	27,099	130,253	69,042
3. Lin.ft. drilled per cu.yd.	.471	.599	.848
4. Total drilling time, hr.	1,488	6,104	3,200
5. Lost time, hung steel, hr.	60	237	95
6. Lost time, moving, hr.	374	1,281	469
7. Lost time, other losses, hr.	128	466	194
8. Net drilling time, hr.	926	4,020	2,443
9. Ratio of net to gross time	.623	.659	.763
Consumption of Steel and Bits			
10. Rods used	120	219	195
11. Rod metal consumed, lb.	2,750	13,134	4,152
12. New bits used	.....	4,454	.....
13. Bits reground once	.....	3,680	.....
14. Bits reground twice	.....	2,320	.....
15. Bits reground three times	.....	708	.....
16. Bits reground four times	.....	36	.....
17. Fresh points used, total	1,913	11,198	6,688
Loss and Breakage of Rods and Bits			
18. Rods broken	17	83	14
19. Shanks broken	6	37	5
20. Bits broken	.....	461	.....
21. Threads broken	.....	207	.....
22. Rods stuck	69	58	16
23. Losses, total	92	846	32
24. Losses per 1,000 points	48.1	75.6	5.5
Performance and Losses (Per 1,000 ft. of drilling)			
25. New bits used	.....	34.2	.....
26. Fresh points, incl. regrinds	70.6	85.9	96.8
27. Rod consumed, lb.	101.5	100.9	60.1
28. Rods broken	.63	.64	.20
29. Shanks broken	.22	.28	.07
30. Bits broken	.....	3.54	.....
31. Threads broken	.....	1.59	.....
32. Rods stuck	2.55	.45	.23
33. Losses, total	3.40	6.50	.50
Drilling Rate			
34. Drilling rate, ft. per hr.	29.24	32.80	28.26
35. Drilling, ft. per fresh point	14.17	11.63	10.32
Costs, Cents Per Ft.			
36. Drilling cost	8.86	8.19	9.17
37. Shop cost	2.40	0.99	1.05
38. Nipping cost	3.36	0.52	1.34
39. Material cost*	1.13	2.09	0.69
40. Total cost per ft.†	15.75	11.79	12.25

*Cost each, new detachable bits: Gage in. 2, 2¼, 2½, 2¾, 2¾
Cost, cents 26, 27, 28, 30, 31
Cost, 1¼-in. hollow drill steel: 47½c. per ft.
†Does not include superintendence.

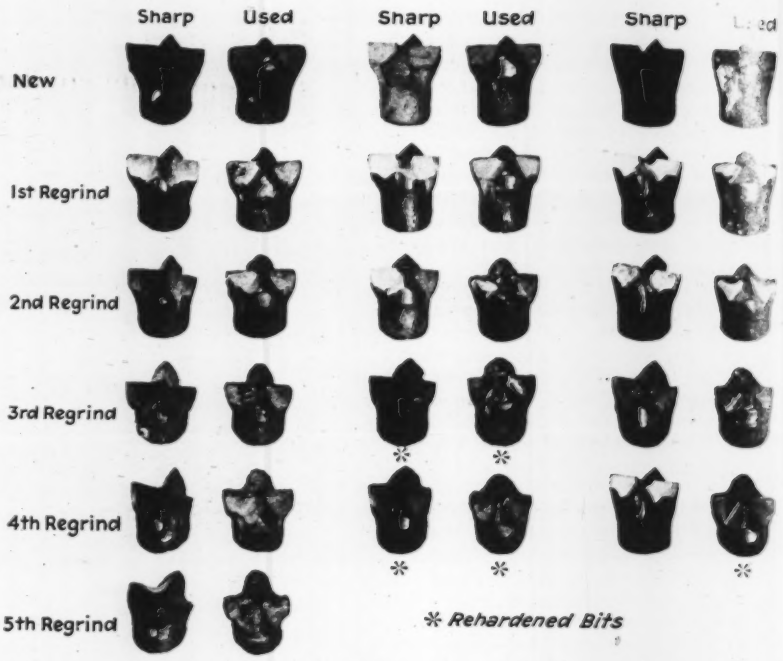


FIG. 4—APPEARANCE of detachable bits before and after use when new and when reground.

Breakage of the rods was high, especially in tests 2 and 3, occurring through the threads in most cases, due to pounding of the bits in removing them from the rods, faulty heat treatment, fatigue and possibly insufficient area of the cross-section through the threads. Subsequent improvement in heat treatment reduced the rod breakage considerably. In test 4, rod breakage was low, but bit breakage was high, the bit giving way before the rod under excessive strains.

It was rather surprising to find that practically as much rod steel was consumed with the detachable bits as with the forged bits (item 27 in table). The more intensive use of the removable bit rods, resulting in high fatigue stresses, accounts for the heavy rod consumption. Furthermore, every time a bit broke, the rod became battered and had to be cut off and rethreaded.

Detachable-Bit Performance—One of the difficulties which the inexperienced crew had to overcome was removal of the bits from the rods. All through test 2, a heavy hammer was used to loosen the bit, resulting in much breakage of both bit and rod. In tests 3 and 4 a more satisfactory method of removal was adopted; the bit was rested on a rail serving as an anvil, and the collar was struck a few blows with a light hammer. A blow on one of the lugs then usually loosened the bit. A few drops of oil on the thread facilitated bit removal.

Breakage of the bits varied with type. One type had excessive breakage through relatively thin walls, which resulted in heavy rod losses also, for every breakage caused a battering of threads, which required cutting off the rod and forming of new threads. Another type of bit stood up well, but its design was such that rod breakage through the threads was common. The third type of bit showed little breakage.

Possibilities of regrinding and retempering the detachable bits were thoroughly investigated. At first, the grinders were inexperienced and ground off more hardened material than probably was necessary. These bits wore well after the first regrinding, but battered badly thereafter. Later experience indicated these bits to be good for two regrindings with proper work. A greater depth of hardening and experience in regrinding resulted in much better sharpening results in test 4; the bits stood up well after two regrindings.

Sticking of rods in tests 2, 3 and 4 was much lower than in the first forged-bit run, but somewhat higher than for the second forged-bit test. Drilling through a seam or loose rock was the principal cause of sticking. Better blowing facilities of the removable bits kept the holes clear of cuttings and reduced the hanging up of steel. Very few of the hung rods could be unscrewed from the detachable bits for, especially on long rods, it was impossible in most

cases to apply sufficient force to loosen the bit. Often, the bit turned with the rod.

Conclusions and comments

The report draws the general conclusions that detachable bits prove more economical for Norris quarry conditions. The cost per foot of hole drilled by the removable bits averaged less than that by forged bits even under favorable conditions. Other conclusions are drawn as follows:

Under the conditions existing in the Norris Dam quarry not much difference was disclosed in the relative merits of the various makes of detachable bits, assuming that the high breakage of one type can be overcome by changes in design.

The removal of bits from the rods is not a serious problem. Oil applied to the threads helps to keep the bits from binding.

It is not possible to recover all rods in the event of stuck bits. The bits may turn with the rod but not come up.

Assuming that most drill rods are developed to suit the conventional drilling and tempering requirements of forged bits, it may be possible to reduce rod breakage by modifying the characteristics of the steel to suit detachable-bit service.

Transportation and handling of steel is a heavy cost factor in the use of forged bits. The second forged-bit test indicated that while this cost can be held down, drilling with forged bits might be as economical as with removable bits.

Throughout the report are numerous interesting comments of various kinds, many resulting from observations rather than from test data. Some of these are:

No tests were made of the metallurgical characteristics of the various types of removable bits, but in general their metallurgy appeared superior to that of forged bits.

A passive resistance to the use of the detachable bits was noticed on the part of the drill sharpeners, apparently because of fear of being replaced. However, the sharpeners can be used to advantage for regrinding and retempering the bits, though this work demands a certain skill on the part of the operator. At Norris the majority of bits were used three times. More skill and experience in grinding and tempering probably would have increased the use of bits five or even six times.

The high loss of rods with detachable bits is not generally realized. It is believed that by keeping more threaded rods available fatigue stresses will be reduced and greater footage per rod will be obtained.

The tests were made almost a year ago, and in the meantime the bit manufacturers have been improving their product. A similar series of tests today might show different results.

The tests were instituted by A. J. Ackerman, in cooperation with Ross White, general construction superintendent, and were directed by J. K. Black and H. R. Johnston. The manufacturers of detachable bits supplied valauble cooperation and advisory service at all times while the tests were in progress. Arthur E. Morgan is chairman and chief engineer, and Carl A. Bock is assistant chief engineer in charge of all construction operation of TVA. At Norris Dam, Barton M. Jones is construction engineer and Fred C. Schlemmer is acting construction superintendent.

Experience in Three Mines Favors Detachable Drill Bits

Trials in Michigan, Tennessee and California mines show increased drilling speeds and substantial savings in cost by removable units over forged bits

EXPERIENCE in the use of detachable bits in mining is of interest to construction, for rock-drilling problems are similar in the two industries. Because of the stable character of operations in mining, it is possible to obtain more accurate performance and cost data than it is on most construction projects. Three mines in widely separated locations in Michigan, Tennessee and California have reported results of thorough trials with removable bits, and all three show substantial cost savings in the use of the detachable bit.

A summary of each report follows, abstracted from two papers read before the American Mining Congress in Chicago Sept. 23-27, 1935, and from an article published recently in *Engineering and Mining Journal*.

Greenwood Mine, Ishpeming, Mich.

According to a paper presented at the American Mining Congress by R. D. Slatterley, superintendent, Greenwood Mine, Ishpeming, Mich., the use of detachable bits in that mine cost 15.12c. per bit, as compared with 26.4c. for each forged bit, a saving of over 11c. per unit. Furthermore, drilling speed was increased 40 per cent by the use of removable bits, a saving in drill steel of one-third was obtained, and the use of smaller bits and drilling of smaller holes was possible, resulting in a material increase in drilling efficiency. It was found that the removable bits could be used six times, including five regrindings and one retempering.

One thousand bits were used six times in the trial runs, but out of the 6,000 possible fresh points, 5,000 were actually obtained, as there was some loss in transportation and by breakage. Table I summarizes the cost data of the trials.

TABLE I—GREENWOOD MINE DETACHABLE BIT COSTS

Item	No. of Bits	Unit Cost	Total Cost
New bits	1,000	$0.27	$270.00
1st regrind	1,000	.05	50.00
2nd regrind	933*	.05	46.65
3rd regrind	867	.05	43.35
4th regrind and temper	800	.07	56.00
5th regrind	400	.05	20.00
Total	5,000 points		$486.00

*This and following reductions due to loss and breakage.

Unit Cost per Point Used, Cents	
Unit cost per point	9.72c.
Preparation of rods, per point used	3.00
Loss of steel, per point used	2.40
Total cost per point	15.12c.
Ave. cost per forged bit used	26.40
Saving per point detachable bit	11.28c.

As originally operated, the mine used shop-forged bits, and the transportation problem of moving the steel from shop to the isolated deposits of the property was a considerable item of expense. The forged bits were of the cross type, with gages ranging from 2⅞ in. on the starter drills to 1⅝ in. on the longer steels, with ¼-in. gage changes for every foot of increase in steel. Drilling speeds with this type of bit in rock or jasper (a hard iron formation) using a 4-in. mounted machine were about 2 in. per min. The ore, consisting of hard hematite and magnetite, was drilled with 3-in. mounted machines at the rate of 3½ in. per min.

Experiments on the detachable bits have been under way for the past two years. At the start of the experiments the detachable bit was in the primary development stage, and much difficulty was encountered, due mainly to imperfections in manufacture and the metallurgy of the bit. It was found that the bit could be made of a higher carbon steel than that used in the drill rod, resulting in a harder temper and a longer drilling life. The author of the paper states that he believes further progress can be made in the improvement of the metallurgy of the bit by the use of special steels and alloys.

Another difficulty encountered early in the experiments was in regrinding the bit. Many grinding wheels were used before a satisfactory grade of ma-

terial was secured. The type of grinding machine finally selected was a wet grinder with two wheels, one for grinding the cutting edges and one for grinding the gage. The cost of grinding at first was excessive, but after the machine and grinding wheel were perfected, this cost was finally brought down to a reasonable basis. Today the cost of grinding is 5c. per bit, including all labor and supplies.

A third difficulty encountered in the use of detachable bits was the matter of educating the miners to their use. At first, many broken threads of the rods resulted from carelessness in attaching the bits. Another difficulty was to educate the men into frequent changing of bits before they become dull.

Experience has shown that a new bit will have a total of six to seven uses before being discarded. After three regrindings the face of the bit is worn down below the factory temper, and the bit is then reground and retempered in an oil-burning muffle furnace. In retempering, the bits are quenched by standing the cutting edge on a screen set to a depth of ⅜ in. in water. After the bit has been retempered, it may be reground twice more.

The cutting properties of the detachable bit were found to be much greater than those of the shop-forged bit. Experiments showed that the detachable bit is able to drill 40 per cent faster than the forged unit. This large increase in drilling footage has resulted in important savings in the cost of the bits, transportation, drill-machine repair cost, air consumption, and a saving in the use of smaller machines and smaller drill steel.

After many experiments in forming threads on the rod, the most satisfactory method of preparation was found to be to size the rod first to proper diameter in the drill sharpener, anneal in lime or mica, and then cut the thread with special dies on a bolt-threading machine. The rods were heated in an oil furnace having a pyrometer temperature control. The cost of conditioning and threading the rods has now been reduced to 3c. per run of each bit. The average life of a threaded end of a rod is from 250 to 300 min. of drilling.

The cost of drill steel purchased to keep the mine supplied with rods has decreased one-third with the use of the detachable bit.

Zinc Mines, Mascot, Tenn.

In five months' experience at the Mascot, Tenn., mines of the American Zinc Company of Tennessee, the aggregate of costs of drilling with detachable bits was 8.633c. per foot drilled, as compared with an average of 9.281c. per foot with conventional forged bits. Table II shows the comparison of costs between the two types of bits. The results of the trial were revealed in a paper read by Harley A. Coy before the American Mining Congress.

TABLE II—COMPARATIVE DRILLING COSTS, MASCOT MINES

	Forged Bits (1927–31)	Det. Bits (1935)
Total footage drilled	1,738,171	177,567
	Cost Per Foot Drilled, Cents	
Steel sharpening, labor	0.809	0.635
Drill steel	0.541	0.273
Fuel oil, furnace	0.125	0.031
Oil and cyanide	0.008	0.008
Sharpener repairs	0.143	0.145
Tools and grinding wheels	0.023	0.173
Detachable bits		0.689
Steel transportation	0.255	
Steel loss	0.027	0.007
Drill repairs	0.933	0.530
Compressed air, drilling	6.345	5.943
Misc.	0.072	0.199
Total per foot	9.281	8.633

TABLE III—SPRING HILL MINE TESTS

Performance:	
Total footage drilled	10,082
Detachable bits consumed	317
Total fresh points	1,422
Aver. footage per point	7.09
Aver. number uses per bit	4.50
Cost:	
New bits—317 @ 32c.	$101.44
Preparing rods—12 @ $1	12.00
Regrinding bits—1,105 @ 7c.	77.35
Total cost	$190.79
Aver. cost per foot drilled	$0.0189
Prev. aver. cost forged bits per foot	.0308

The ore-bearing rock at Mascot is dolomitic limestone, and the metallic mineral is zinc sulphide occurring principally as filled veins or seams in limestone and in association with secondary dolomite. The average ore presents no particular drilling difficulties, but occasionally chert beds or chert nodules are present, and these, when encountered, retard drilling progress and increase the wear on bits.

The forged type of Carr (chisel) bit had been in use at Mascot for many years. However, in adopting the detachable bit, the cross-type bit was selected because of its greater safety and ability to hold its gage.

Following preliminary tests in which three makes of detachable bits were given a trial, one type was selected for the five months' experimental run. A gage variation of ⅛ in. per change was adopted, using 2⅛-in. starters.

At first the drill rods were threaded by a lathe, but this method of preparation weakened the rods and resulted in heavy breakage. Consequently a forging die was installed on the drill sharpener for forming the threads.

Usually five bits were sufficient for a machine shift. Owing to the accumulation of resharpened bits, the only new bits issued in actual practice were of the starter gage size, 2⅛ in. When unusual gage wear, but not great loss in stock occurred, the bits were upset on the drill sharpener by means of a special die and bit holder developed in the local shop. All upset bits were ground, gaged and tempered.

The average temper depth in a new bit is approximately ⅜ in. After this hardness was lost, bits were retempered. This usually followed the third grinding. For tempering, the bits were heated to 1,400 deg. F. and then quenched in ⅜ to ½ in. of water, where they remained until cold. The depth of quenching was determined by the amount of stock in the bit.

During the first five months of 1935, a total of 4,824 new 2⅛-in. bits was purchased at an average cost of 2.36c. During this period 27,312 bits were reground, including 966 bits that were upset, or an average of 5.66 bits reground per new bit purchased. The average bit drilled 36.81 ft. at a per-foot cost of 0.689c. for material.

In the grinding of the 27,312 bits, 32 forming wheels were used, or one wheel per 853.5 bits ground, at a cost of 0.881c. per bit.

For tempering, the thread ends of the drill rods were heated to 1,600 deg. F., then submerged in 8 in. of fish oil for 30 sec., after which they were cooled in about ⅜ in. of water.

Spring Hill Mine, California

At the Spring Hill Mine, at Grass Valley, Calif., a test run recently made on detachable bits showed a saving of 40 per cent in drilling cost and 60 per cent in steel cost. Details of the test were published in the May, 1935, issue of *Engineering and Mining Journal*. The summary of cost data, given in Table III, shows an average drilling cost of 1.89c. per foot for removable bits, compared with 3.08c. for forged steel.

The study covered 51 days of operation in diabase, serpentine and quartz vein material. A total of 10,085 ft. was drilled during the study, using 1,422 bits, showing an average of 7.09 ft. per bit. The hardness of the rock varied over a wide range, which of course affected the footage per bit. For example, in soft serpentine, one bit made a maximum of 180 ft. before becoming dull, and an average of 113.3 ft. per bit was made by three bits used in six shifts drilling a total of 340 ft. In hard diabase 3.8 ft. per bit was secured.

Besides the savings in cost of drilling, the amount of capital tied up in steel was considerably reduced. To provide sufficient bitted steel to maintain operations over a period corresponding to this test, the management states that a minimum of 250 rods would have been required, costing $280. To this must be added the cost of bitting and shanking, 75c. per steel, or $187.50, amounting to a total initial investment of $467.50 before drilling started. When using the detachable bits, however, only twelve rods were required, representing an investment of but $39.60. To this may be added the initial cost of the bits used, $101.44. The basic comparison of steel investment shows a first cost of $141.04 for the removable bits as compared with $467.50 if sharpened steels had been used.

Current Notes on Sewage Disposal

An interpretative summary of recent developments for the engineer, research worker and plant operator

Bio-Zeolites

The function of the activated-sludge floc, and thereby the theory of mechanism of the activated-sludge process, has been variously defined by different authors as a scrubbing action, mutual coagulation of sewage colloids by the neutralization of electrical changes, a purely biological function, a strictly physico-chemical action or combinations of these activities. Theriault (*Public Health Reports*, Nov. 8, 1935) states that in his studies attention was focused on the floc itself as the primary absorbent of finely divided and colloidal substances, apart from the embedded bacteria, secreted enzymes and microscopic animals that are associated with the floc. Such a view of sewage clarification raises a difficult question in regard to the nature of the gelatinous matrix which has hitherto been generally regarded as an indissoluble component of the bacteria. The author claims that new light is afforded by his work, indicating that the absorbent principle in activated sludge has been definitely identified as a base-exchange substance, chemically the same as the zeolites of water purification.

Leafmold Aids Sludge Digestion

Experiments on the digestion of fresh sewage sludge mixed with thoroughly rotted leaves have just shown that this procedure hastens sludge decomposition without the usual odors or acid production that results from the digestion of unseeded solids. Having previously observed that leaves falling into a pond contaminated with sewage passed through a rapid stage of decomposition, Reichle and Sander (*Gesundheits Ingenieur*, No. 58, 1935) found that when rotted leaves (1 to 2 per cent by volume) were added to a poorly digesting mass of acid sludge a rapid improvement in gas production resulted, accompanied by a change from acid to alkaline digestion. Addition of rotted leaves to milk wastes caused favorable digestion to start in three or four days with the acid phase of decomposition gradually changed to the desired alkaline reaction. Sulphite paper waste, to which small quantities of leaves were added, were rapidly digested with the production of large quantities of hydrogen sulphide. The addition of rotted leaves to poorly digesting materials and to unseeded sludge tanks in new plants is of interest in the realm of practical sewage treatment as an economical method in starting alkaline digestion.

FOR MUNICIPAL ENGINEERS

THIS authoritative compendium of current new knowledge in the actively growing field of sewage disposal, will be a feature of *Engineering News-Record's* service to the municipal engineer during 1936.

IT IS PLANNED for the notebook of engineer, research worker and plant operator. Each instalment will comprise carefully selected and competently appraised information from sources both here and abroad on stream pollution, sewage and trade-waste treatment.

COMMENT and discussion on the matters presented will be welcome; it is suggested that brief and clear statement and reference to specific fact will be especially helpful.

THE EDITORS.

Activated Carbon in Sewage

Activated carbon has gained favor rapidly in odor and taste control in water treatment. Recently this product has also been found useful in sewage treatment. Laboratory and plant experiments over a period of a year or more by Rudolfs and Trubnick (*Sewage Works Journal*, September, 1935) have shown that activated carbon added to poorly digesting sludge tanks accelerated digestion, increased gas production and assured better drainability of sludge and a clearer liquor. Carbon prevented the sludge from becoming acid and in certain respects played the same role as lime, which is now generally added to improve conditions. In settling tanks the addition of carbon materially reduced scum formation and the production of odors. Carbon is apparently capable of removing soluble organic compounds, so that the oxygen demand of incompletely oxidized effluents and of effluents from chemically treated sewage is lowered. All types of activated carbon are not equally effective.

Settling Tanks in a New Role

Design of sedimentation tanks in America has been based on the assumption that detention periods should be limited to the minimum time required for removal of the heaviest settleable solids in order to prevent sewage from becoming stale. English ideas and practice, as reflected in a recent paper by Whitehead and O'Shaughnessy (*The Surveyor*, Oct. 13 and 25, 1935), embody a different viewpoint. It is pointed out that an important function of the sedimentation tank lies in its serving as a mixing and equalizing unit. With long detention periods (12 to 15 hours), it is possible to obtain a mixture of the weakest night flow and strong day sewage, so that the load on the biological portion of the plant is equalized in strength. This is especially important when trickling filters follow the settling tanks. Operating results show that considerable self-purification of sewage takes place during long periods of detention in sedimentation tanks.

Trade Wastes and Activated Sludge

Floc formation and purification in the activated-sludge process are disturbed by moderate quantities of salts, large quantities of mine waste, coal dust and very small amounts of chlorphenols Sartorius (*Archief Hygiene*, No. 114. 1935) reports results of laboratory experiments with aeration tanks equipped with paddles showing that moderate amounts of common salt, sodium sulfate and other sodium salts, although each acting differently, were all detrimental; the ultimate results depended upon the kind and amount of salt used. Curiously, small quantities of phenol caused improvement. Coal dust may help, but its effect decreases rapidly, and the resulting sludge is changed. Continuous addition of these types of trade wastes, was cumulatively detrimental.

Treatment of Poisonous Wastes

Certain industrial wastes are extremely difficult to treat, and no economical and efficient methods have been proposed. This applies particularly to substances that are poisonous. Many engineers and investigators have faced the problem of disposal of gas-house wastes containing phenols and cresols, or coke oven or other wastes containing

cyanides, either alone or present in small quantities in sewage. Treatment of gas-house waste with the employment of the indirect process of ammonia recovery is available. Cyanides are difficult to remove, and even in small quantities they upset biological treatment processes. The English Water Pollution Board (Technical paper No. 5, 1935) has found that conversion of cyanide to ferro-cyanide by treatment with ferrous chloride is feasible. The deleterious action of cyanide wastes was diminished and in some cases completely destroyed by the addition of pickling liquor (iron wastes) and lime following complete and vigorous agitation of the mixture.

Fish, Oxygen and Trade Wastes

Many engineers, city officials and fishermen have observed behavior of fish similar to the following:

> In early May the smolts (two-year-old salmon) swam feebly near the surface of the water, especially near the banks, where many of them were left stranded as the tide fell. In the later period of migration they appeared quite suddenly at the surface, swam rapidly round in circles, often swimming on their sides, and after a few minutes disappeared equally suddenly. Sometimes a fish would swim violently in an almost vertical position, with its head out of water.

Frequently the case of migration and death of fish is assumed to be due to lack of oxygen. In a report on the River Tees, the Water Pollution Research Board of England (Technical Paper No. 5, 1935) states that trout have been kept alive for 34 days in water containing dissolved oxygen to the extent of only 37 to 58 per cent of the saturation value, and that other short-period experiments indicated that over periods of several days the minimum oxygen concentration necessary for trout is considerably below this value. On the other hand, a concentration of 0.2 p.p.m. of cyanide is sufficient to cause trout to overturn in less than 15 min. It required from 0.4 to 0.6 per cent of phenol or cresol to overturn the fish in about 500 min. Mixtures of poisons have as a rule greater toxicity. Salmon and sea trout smolts migrating up the estuary of the Tees were greatly affected by effluents from gas works and chemical industries.

Iron in Activated Sludge

Experiments on the effect of iron salts tend to show that serious doubt exists about their supposed stimulating character upon activated sludge. Biological activities play an important role in the activated-sludge process, and heretofore a number of investigators have suggested that iron aids rapid stabilization. Nesmejanoff (*Gesundheits Ingenieur*, No. 58, 1935) added varying quantities of different types of iron compounds, and they either did not affect the oxidation and clarification of the mixtures or were definitely detrimental. It is possible that the claims and counter claims made by various investigators depend upon the quantity as well as the type of iron compound used.

Artificial Rain with Sewage

Of particular interest to the enthusiasts of conservation and utilization of the fertilizing elements in sewage is the renewed activity in Germany toward "productive sewage and waste treatment." Changes in economic conditions there have directed attention to a wider use of domestic and trade wastes for farm irrigation. Schonnopp (*Vom Wasser*, No. 9, 1935) presents an "artificial rain" scheme in which land is sprayed periodically with sewage pumped through movable pipe lines provided with nozzles. Such spraying not only supplies moisture to the growing crop but contributes the fertilizing elements present in the sewage.

Shortening Digestion Time

Semi-plant-scale studies on a system of consecutive (2-stage) sludge digestion, using a primary period of high temperature (130 deg. F.) digestion and a secondary period of low-temperature (80 deg. F.) conditioning show this to be a practical scheme for the rapid decomposition of sewage solids. During the last ten years sludge digestion has been improved from an unreliable, troublesome procedure requiring several months for completion to the present controlled gas-producing process requiring from 30 to 40 days for stabilization of offensive solids. These results have been obtained by maintaining proper conditions, of which temperature is an important factor. Laboratory experiments in 1931 showed that the time required for digestion could be reduced to four or five days when higher temperatures (130-140 deg. F.) were employed. However, under these conditions, the sludge produced was odoriferous and difficult to drain. The two-stage digestion process later tried, as reported on by Cleary (*Sewage Works Journal*, September, 1935) showed several advantages over either the high- or low-temperature single-tank operation. It reduced the digestion time to twelve days, less sludge remained, and there was an increased rate of gas production. More than three-quarters of the gas was produced during the first five days of high-temperature digestion.

Innoculated Activated Sludge

For a number of years the question of innoculating activated sludge with bacteria has been discussed, but little or no definite information has been presented. Sartorius (*Archiv f. Hygiene*, No. 114, 1935) added concentrated suspensions of different bacteria to the sewage and sludge mixtures that had been receiving trade wastes. He concludes that two organisms—B. fluorescence and B. proteus—helped most and others had little or no effect. The possibilities of adding cultures of specific organisms to activated-sludge treatment works where difficulties are experienced due to the presence of trade wastes or other causes have precedent in agricultural practice where soils are frequently innoculated with bacterial strains to aid the growth of alfalfa.

An Aid In Odor Control

Many methods have been tried to prevent odor production from certain sewage-treatment processes. When sewage is settled in Imhoff tanks and the effluent aerated before it is placed on trickling filters, odors may be expected, especially in the warmer sections of the country. Mahlie (1935 report of the Fort Worth, Tex., sewage-disposal plant) reports that aeration of the Imhoff tank effluent, with and without returned sludge from the final clarifiers, caused considerable odor complaint. Bypassing the effluent and placing it directly on the trickling filters changed the quality of the effluent slightly, but no odor difficulties have been experienced since the practice was started. This is paralleled by several instances abroad where settled sewage was aerated after passing through the trickling filters rather than before. It was found that this relieves the load on the river and appears to cause less odor nuisance.

Public Works Merger Sought at Boston

A recommendation to the Boston City Council that nine municipal departments and one division be merged into a single public works department, to be headed by a commissioner at a salary of $12,000 per year, has been made by the mayor. The proposd department would embrace all the engineering functions of the city government, and would be organized into the following divisions: survey and project, design and construction, building inspection, division of standards, electrical, bridge, tunnel, ferry and airport, highway, sanitary, sewer, water, park, public buildings. Two deputy commissioners and a secretary would be appointed by the head of the department subject to the mayor's approval. Each engineering division would be in charge of an engineer of recognized standing, appointed and approved as above. The commissioner and deputies would constitute a board to exercise the special powers now vested in the board of street commissioners and the regulatory power now vested in the traffic commission. This centralization of engineering, including administrative and budgetary activities, construction and planning, would result in substantial savings.

Highway Officials Stress Safety as Major Problem

Safety of the road receives major attention of 300 delegates at largest convention in the history of the American Association of State Highway Officials

AROUSED by the mounting toll of accidents, highway officials from 45 states made safety of the road the leading subject of discussion at their twenty-first annual meeting held Dec. 9 to 12 at Miami, Fla. Opening with an earnest call for action A. V. Brandt, commissioner of highways of New York, president of the Association, introduced Thos. H. MacDonald, chief, U. S. Bureau of Public Roads, who outlined a federal and state organization for traffic control, to work in coordination with federal and state highway departments for engineering control.

Papers by Sidney J. Williams, National Safety Council, on safety control of highway traffic, by Kirk M. Reid, General Electric Co., on night lighting, by J. D. Adams, Indiana Highway Commission, on separated traffic lanes, and by E. C. Lawton, assistant commissioner of highways of New York, on grade-crossing elimination, were other high spots in a program which included prominent mention of traffic safety in almost every address and discussion and gave two full sessions of the division of traffic control and safety to a discussion of speeds, intersections, markings, signals, passing zones, portable checking stations, traffic circles, road and vehicle design and their interrelation.

All discussions were animated by a very evident anxious concern in and sense of responsibility for the prevalence of accidents in highway travel and an equally obvious uncertainty of how to undertake the solution of the problem. The result of all was more to arouse a determination to begin a positive offensive against accidents than to determine a definite plan of attack.

Plan of action essential

The existing situation was expressed by Thos. H. MacDonald, chief, Bureau of Public Roads, in his statement that "In general, we are not reducing to effective action what we know to be sound and are not carrying on adequate research to clear our blind spots in traffic control." Three phases of the problem were: a reliable source of accident statistics, a national transportation safety program, and in future design a recognition and acceptance rather than opposition to evident trends in traffic. In the last instance for example, "Highway design must recognize the trend to higher speeds and provide for these to the extent they may reasonably be expected to become established by public usage."

In the important matter of accident statistics, Mr. MacDonald pointed out that while it is true that a large volume of figures is collected by many agencies and a conscientious effort is made to analyze these correctly, actually the figures of the Bureau of the Census are the only ones that give a correct picture for the nation as a whole, and within that bureau there is the recognition that they are dependent upon the reporting accuracy of a large number of individuals.

While the Census Bureau has for a long time been engaged in perfecting means of gathering facts as to automobile fatalities, it is only for the two years (1933 and 1934) that a complete nation-wide coverage has been obtained. Therefore, in all previous comparison of trends, it has been necessary to extend the actual facts reported, and the accuracy of these extensions is problematical. In 1932 the coverage of the bureau reached within 3.7 per cent of the total population, so that the extension of the number of fatalities to cover the whole population was probably without serious error. The number of fatalities attributed to travel on the highways is covered for 100 per cent of the population for 1933 and 1934, and these have been put through a process of most careful scrutiny, so that they are accurate and reliable.

Briefly, there was an increase in fatalities in 1934 over 1933 of 4,738, and in 1934 there were total fatalities of 36,101. In the 95 cities of more than 10,000 population the total fatalities in 1934 were 10,361, an increase of 918 over the previous year. The fatalities in these cities were 28.7 per cent of the total. It is evident, therefore, that if we are to better this record materially, we must look to the smaller towns and the rural districts. In the popular conception the fatalities from collisions between automobiles and railroad trains and streetcars are considered a major cause of the alarming increase in deaths. Between these two years the increase in fatalities from these causes was insignificant; as reported, the total deaths in 1934 were 1,789, which is only 37.5 per cent of the increase alone in fatalities between the two years, and actually represents less than 5 per cent of the total fatalities occurring in 1934.

It is evident, therefore, said Mr. MacDonald, that the Bureau of the Census is the only agency that can be relied upon to give accurate basic data and that "It must be given sufficient funds to enlarge greatly it operations," particularly in the education of the individuals who report these vital statistics.

The essential action, however, Mr. MacDonald considered, was organization, and without any claim for novelty the following plan was advanced: There would be two principal divisions in the major organization—first, federal, and second, state—and each of these divisions would consist of two branches: (1) an official committee appointed by the Chief Executive, or through legislation, consisting of those elective or appointive officers who have the legal responsibility and authority to act in this field; and (2) an advisory committee on safety consisting of representatives of organizations and individuals who are now engaged in safety work.

The function of the official committees, state and federal, would be to formulate regulations and policies and to administer these; the functions of the advisory committee would be to encourage and support the public officials and their law-enforcement officers, to suggest regulations and legislation, to help secure and sustain these, and to carry on a constant campaign of education in every possible form, to the end that the public shall become safety-conscious. The importance of these advisory committees, it was stated, cannot be overemphasized, for unless the official groups, federal and state, have the backing of an intelligent and vigorous public support, their work cannot be effective.

Such an organization can be put into effect on executive order and would make use of existing legal authority and organizations which must in the end be responsible for results. Its first action would be to develop a detailed program and assign definitely the different activities proposed; the nation would then have for the first time a coordinated plan in which both state and federal governments could function in harmony. The same type of organization might well be extended into the city and major local subdivisions of government.

But with statistics and organized traffic control, said Mr. MacDonald, there had to be foresight in road design. Speaking particularly of increasing traffic speeds, it appeared that these indicate the recognition of two general classes of highways: those for through or main-line traffic and those for local and tributary service. For the first class, ample width of traffic lanes, safe sight distances, easy curvature, superelevation, non-skid surfaces and clear vision of intersecting roads are essentials of proper design. Where multiple lanes are necessary, it is recognized that

in general the two opposing directions should be separated.

A serious fault that now exists in many otherwise high-class highways is the inclusion of short sections in which the design as to curvature, sight distance or other details falls below the general standard of the road. A very substantial contribution can be made by highway engineering to the safety of highway use by adequately designing all component parts of the highway structure for safe travel, "not only at the speed with which traffic now moves but for the speed which observation of the general trend indicates will be the average in the years ahead." Practically one-half the fatal accidents are to pedestrians; on through highways, then, footpaths and sidewalks, which will actually be used by pedestrians, must be made an integral part of the design.

Lighting of roads

Continuing the discussion of engineering design for safety, Kirk M. Reid, General Electric Co., presented conclusions on the fundamentals of road lighting as determined on the one-eighth-scale model road at Nela Park laboratories of the General Electric Co. This model road affords the equivalent of 2,000 ft. of roadway, with a choice of five pavements and with other conditions representative of actual service. It is equipped with three lighting systems—sodium-vapor, mercury-vapor, and incandescent—separately controlled and flexible as regards lamp size, spacing, mounting height, arrangement, transverse position and light distribution. As the result of some thousands of observations, the following facts are indicated:

1. With a representative highway-lighting system, objects are seen as silhouettes—that is, as darker than their background—at over 80 per cent of the locations on the roadway. It is, therefore, desirable to light the pavement so that all parts of it appear substantially uniformly bright when viewed from the position of driver or pedestrian. A light-colored mat-surface pavement offers the best visibility and safey by night, whether the illumination is provided by fixed highway lighting or by automobile headlights.

2. When using the same amount of light similarly distributed from sodium-vapor, mercury-vapor and incandescent lamps, one sees objects of interest from the standpoint of safety just as far away and just as soon with the one kind of light as with the others. There is no difference in the ability to detect the presence of an obstacle or to discriminate between hazards.

3. With a light distribution representative of current highway-lighting practice, the glare from the equipments was found to interefere with seeing to such an extent as to waste as much as 50 per cent of the illumination.

4. A highway with a uniform horizontal illumination throughout its length presents a large variation in brightness when viewed by driver or pedestrian. For uniform brightness, the light must be distributed to take account of the specular or direct reflection of light at small angles from the surface, which is pronounced even in the case of the more mat-surfaced pavements. This requires a more exact and complete control of the light flux than has been obtained with past types of highway-lighting equipment. Light striking the pavement in a direction away from the observer is of little value in building pavement brightness. It is the light coming to the pavement and reflected toward one that is effective.

5. Using the standard pole spacing of 125 ft., it is feasible to obtain this high order of brightness uniformity economically and at the same time to shield the sources sufficiently to obviate to a very large extent the "seeing loss" from glare.

Grade-crossing elimination

"The first, most important and perhaps the only reason for eliminating highway and railroad grade-crossings is to save human life." This was the hypothesis on which E. C. Lawton, assistant highway commissioner of New York, presented his consideration of this phase of safety engineering in road design.

Based on this hypothesis, the controlling objective in crossing design was to see that no new hazards were introduced by the change that was to eliminate the old hazard. To meet this requirement, the following practices have been developed from experience in eliminating some hundreds of crossings planned and being planned under the state $300,000,000 bond issue and the recent federal relief works grade-crossing funds:

No curvature is permitted on approaches (on high fills) where highway speeds are not restricted or regulated; in built-up localities where property values are high and where speeds may be restricted, a minimum radius of 1,000 ft. is allowed with 2,000 ft. in open country.

A 7-ft. width of shoulder is required on two-lane pavements with standard side slopes from 1 on 1½ to 1 on 1¾. Guard-rail is placed 5 ft. from the pavement when standard side slopes are used; it is omitted when 1 on 4 side slopes are used (fills up to 4 ft.). More recently the endeavor is to plant or sod embankment slopes and slopes in cut and to surface-treat or especially prepare shoulders to avoid excessive erosion.

It is believed that there is no economic justification for an overhead structure or underpass which provides only three lanes of pavement. A three-lane pavement is viewed as a transitory width, the third lane being the first step in widening from two lanes to four lanes. Typical underpass construction for two-lane pavement requires a 32-ft. clear span between the face of abutments and at least 12 in. from the face of the abutment to the face of curb; the 12-in. offset from curb to abutment is deemed necessary for safety. The 32-ft. width is necessary for snow removal and to continue a shoulder area through a subway section upon which vehicles may maneuver in the same manner as they are permitted to do on shoulders outside subway approaches.

Wherever four-lane pavements are constructed through subways, curb sections are used but never center columns. If sidewalks are necessary, and in most cases some such facility is required, a double curb section is used, each 8 in. high with a 6-in. offset. Back of the curb a safety walk is usually provided, varying in width from 22 to 24 in. In villages and urban areas the sidewalks may be wider. On all underpasses a minimum vertical clearance of 14 ft. from the crown of the pavement to the lowest point of structure is required.

One of the most important highway elements to be considered in grade-crossing design is sight distance, usually limited by the summit of ascending grades. Sight distance is computed from a point 5 ft. above the pavement on one approach to a point 5 ft. above the pavement on the opposite approach. It is dependent, therefore, upon the length of vertical curve used and the approach grades. Usually the plans provide a minimum sight distance of 800 ft. on two-lane and three-lane pavements; on four-lane pavements it may be reduced to 400 ft. in congested areas or where traffic speeds are restricted and controlled. Sight distance determines the margin of highway safety and should be the last feature to be sacrificed in design.

Grades and superelevation on curves are dependent somewhat on topography and location in the state, but generally speaking 4 per cent grades are obtained in flat country and 5 per cent grades in rolling country; superelevation of curves is limited to ⅞ in. per ft.

Highway safety features in order of importance are then: adequate sight distance, proper alignment and reasonable grades; no center columns should be permitted, and a vertical clearance of 14 ft. should be provided. Solid abutments should be provided in highway overhead designs.

On the general subject of overhead versus underpass construction, it is found that the railroads generally favor the former, and the highway departments generally favor the latter. Highway departments generally favor underpasses, as the continuity of pavement and shoulders is maintained and the maintenance of roadway and pavement is more simple and less costly than on overheads. With similar approach grades, the sight distance on an underpass is usually greater than on an overhead structure, and with the same approach grades there is a greater highway hazard on overhead construction than on underpass construction; if a motor vehicle gets out of control on an overhead approach grade, due to icy conditions or inclement weather, it frequently topples over the bank and rolls to the bottom of the fill; this cannot happen on an underpass, as the approaches are in cut. Also, in most cases, there is

a curb on underpass construction which becomes quite an effective guide to keep vehicles in control.

Contrary to popular opinion, desirable limiting grades are determined by difficulties of descending, rather than of ascending, especially when pavements are slippery or covered with ice. Grades are no longer determined by lack of motive power in trucks, as the manufacturer has taken care of that feature. There is a tendency, however, for traffic to dam up on two-lane or three-lane pavement when trucks are compelled to use low gear. But it is found that a very marked difference exists in the behavior of motor vehicles in wet weather, particularly with ice and snow on the pavement, when grades exceed 4 or 5 per cent. Recent experience in sanding icy pavements, supported by complaints from the motoring public, has convinced the department that grades of 5 per cent and more should be sanded during winter in open country, with a limiting grade of around 4 per cent in cities.

In the average elimination the simplest part of the design is the structure carrying the highway either over or under the railroad. The principal difficulty here is to determine in advance the span and width of the proposed bridge. The width on overheads and the span on underpasses (highway openings) should be determined from the volume of *highway* traffic and anticipated development. The span on overheads and the width of underpass structures (railroad openings) should be determined by the volume of *railroad* traffic and anticipated development.

Safety requirements

Specifying the ideal highway as one "on which an ordinarily skillful and prudent driver can reach his destination safely, quickly and comfortably, with minimum wear and tear on his nerves and muscles," Sidney J. Williams, National Safety Council, listed reasonable safety requirements as:

1. A 10-ft. lane width, to provide clearance for safe passing at high speeds.
2. Long-radius curves, widened and superelevated to permit safe operation at the speed that is regarded as normal on the tangents; or a conspicuous sign indicating the maximum safe speed for that curve.
3. Improved intersection design, ranging from widened approaches to complete separation, and including traffic-control signals and signs as needed. Similar improvements and protection at railroad crossings.
4. Shoulders free from obstructions, for disabled vehicles, and as a safeguard for any who run off the pavement; guard-rails on fills and at some curves.
5. Adequate sight distances on both horizontal and vertical curves or conspicuous signs warning of their absence.
6. Illumination at those points where darkness is a hazard which ordinary headlighting will not adequately combat.
7. Center lines and lane lines, non-slip pavement surfaces, snow removal, removal of posts and other obstructions in the roadway.
8. Center separation of opposing streams, on all four-lane roads. This is a great improvement for comfortable and safe travel, and should be so strongly endorsed that any highway engineer would be ashamed ever to build or remodel a four-lane highway without it. Center separation is one strong reason for preferring four lanes to three.
9. And, finally, signs which tell the motorist exactly what he needs to know, with regard to hazards ahead, as well as routes and distances—which always tell the truth, and which are of uniform aspect, location and meaning all over the country.

Most of these are matters of highway design rather than of traffic control, but they are stated, said Mr. Williams, because the job of the traffic engineer is hopeless unless the highway embodies these features, without which satisfactory control is impossible. Concluding, he said:

> It cannot be reasonably expected that all highways can be made ideally foolproof, nor all cars; neither can we develop in a few years a race of super-drivers so marvelously skillful and so careful as to escape all hazards. We can, however, look for those conditions on highways which cause or help to cause too many accidents and we can correct them. We can look for those conditions in the cars that cause or help to cause too many accidents, and we can correct them. We can pick out those individuals that have too many accidents and take them off the highway; we can look for those individual traits or practices that contribute to too many accidents, and concentrate our educational and enforcement energies upon them. It is through no magic panacea but through a balanced program, attacking simultaneously on all these fronts, and especially through a coordinated and organized program in each state and each community that we can make quick and lasting progress toward greater safety.

Supporting the emphatic demand of Mr. Williams for dual pavement on four-lane roads, J. D. Adams, Indiana highway commission, outlined the method of progressive four-lane dual-pavement construction described in *Engineering News-Record*, Dec. 5, 1935.

Miscellaneous safety practices

Sessions of the group meeting on traffic control and safety were conducted as round-table discussions which centered on details of speed control, signs, markings, intersections, passing zones and similar questions of current practice; few new facts and many differences of opinion developed as, for example, whether to mark three-lane pavements on hills for two lanes ascending and one lane descending or the reverse, whether to use dark or solid lines, and whether to use black on white or black on yellow for signs. These questions all disclosed equally positive opponents and proponents.

A novelty in center-line marking mentioned by W. F. Rosenwald as having given successful results in Minnesota was the use of reflector buttons instead of paint stripes. These buttons were found to be sufficiently visible by daylight and remarkably clear at night. They had been reasonably permanent, could be removed and replaced, required occasional cleaning, offered no obstacle to snow removal if the plow blades were slightly raised, and were rather high in cost—about $2 each installed. A second novelty, a portable checking station to control truck loadings, was described by K. C. Wright, of Utah. This device was a two-wheel tractor having a cabin body that served as an office and to carry the necessary testing apparatus; it was hauled by automobile to any of half-dozen selected control points as ordered from headquarters. At each control point a permanent telephone connection was provided and could be connected with the cabin instruments in a few minutes. By making unannounced changes to the different control points, this portable station proved very effective in reducing load violations, at very small cost.

Particularly active discussion was given to speed control. In opening the discussion, E. W. James, Bureau of Public Roads, stated that while it was a logical presumption that high speed was a contributory cause of increasing accident frequency, available statistics did not provide convincing proof. Such records as existed did not furnish the proper denominators to establish true ratios, and without them all conclusions were speculative. Less moderate opinion was generally expressed by others, and the belief was evident that curtailed speed limits were essential to reduction in highway accidents. Experience in Indiana indicated, it was stated, that mechanically governed speed of automobiles in trial installation on department cars had reduced accidents. The opinion was also expressed that governed speeds might also be a source of danger in emergencies where quick acceleration to very high speeds might be an only means of escaping accident.

Technical proceedings

Technical activites in this association are carried on by standing committees and are continuous through the year, and technical papers and discussions at the annual conventions are largely confined to group meetings heading up in the various committees. Usually the proceedings of these group sessions are quite informal, and discussion is an informal exchange of opinion and experience for the information of the committees in their work, which is rounded up finally in the official standards of the association. This year the work on standards has been notably active, principally in revision of bridge and materials practice.

To summarize briefly, in 1931 there were issued the first editions of the bridge and materials specifications in book form, and during 1935 there was

brought to completion an entire revision of both sets of specifications. These have been republished in two volumes of 234 and 315 pages, respectively. In addition, there has been published a specification on arc welding, comprising 19 pages, as a supplement to the bridge specifications.

The new edition of the bridge specifications embodies many important revisions, to bring them into closer conformity with advances that have been made in recent years in the methods of design and construction of bridges. Important changes were made in the sections covering the preparation of concrete, unit stresses for steel bridges, and in the specifications for structural timber.

The section covering structural timber is of special interest, because for the first time the rather complex subject of timber stresses and their relation to grading rules has been completely clarified, so that direct and easy comparisons of the various species of timber can be made, even though classified by different regional lumber associations.

After considerable study and discussion, there was no essential change made in the allowable unit stresses for concrete design, although a majority of the committee is in favor of a further revision of this part of the specifications, and this will be included in the future work of the committee.

In addition to the revised general specifications, the committee on bridges and structures drew up a specification for arc-welding metal bridges. As this is a comparatively new art in the bridge field, it is naturally subject to rapid development, and for this reason the specification has been issued as a separate pamphlet so that it will admit of early revision and reprinting, if desired.

Second Construction Census Will Cover 1935 Operations

Data collected by enumerators in canvass of contractors may be supplemented by mail survey to cover force account work—Compilation begins Jan. 2

A NATION-WIDE CENSUS of construction, covering 1935 operations only, is to be made by the Bureau of Census beginning Jan. 2. The new survey will be more comprehensive than the first construction census, made in 1929, which has been widely used in connection with problems of the industry. In place of the 1929 plan, carried on by mail and limited to a partial coverage of contract operations only, the coming survey will be conducted by trained enumerators canvassing all contracting firms, and possibly coverage will be extended to include a mail survey of certain force-account operations.

Data to be collected

The data to be gathered chiefly concerns value of work done and contracts received, expenditures for materials, wage and salary payments, number of persons employed and man-hours worked, all confined to 1935 operations only. All data will be segregated into five classes of construction: (1) single and two-family houses; (2) other residential building; (3) building other than residential; (4) heavy construction; (5) highways. Each of these five groups of construction will be further classified as new construction, remodeling, repairs or maintenance. Private and public construction will be reported separately. With these breakdowns it is believed possible to present a statistical picture of construction in sufficient detail to be of real value to the industry.

According to present plans, only contract work will be covered, though a supplementary mail coverage of force account work done by utilities, industrial concerns and public agencies is under consideration, and some plan for this additional coverage will undoubtedly be worked out. The enumerators will also list the locations of business establishments regularly engaged in construction, their legal form of organization, and the class of work in which the firm was engaged during 1935.

Some further information will be collected in detail at the request of the industry. For example, two sets of figures will be compiled on construction employment. One set will give an analysis of employees by broad occupational groups for a stated one-week period, and the pay-week ending nearest Oct. 26 has been designated; the other will present the total number of persons employed on the fifteenth of each month, to furnish a check on seasonal employment in construction.

Reasons for the census

The construction census is being taken because of the need for fuller information on construction operations. The results will be of widespread interest, for construction in normal times employs a large portion of America's workers and disburses large sums for salaries and wages, for materials and for equipment. Construction is a vital element in the economic welfare of the nation, and its activities affect many other industries as well as general business conditions in all fields.

Considerable statistical information on construction is already compiled by various agencies, but necessarily on a sample basis, as each reports on only a portion of the total number of establishments engaged in construction. The proposed census, by securing reports from all contracting firms, regardless of size and location, will afford a background against which the industry's current statistics can be built up, and thus increase their usefulness.

For the 1935 census trained field men of the Bureau of Census will make personal calls upon contracting establishments. These men will explain the report forms and assist in the preparation of information. An endeavor has been made to confine the report to essential basic information, and the report form is short in length so as not to require an undue amount of work on the part of the contractor in filling it out.

All reports will be kept strictly confidential. Only sworn employees of the Bureau of Census will be permitted to examine the individual reports. No access to them is permitted by law, even by other governmental agencies, and no information will be disclosed which would reveal any of the facts and figures in the individual reports.

Every effort will be made to complete the field canvass within three months, making possible the issuance of first results by July.

Headquarters for the Census of Business, of which the construction census is a part, have been established at Philadelphia, Pa., with Fred A. Cosnell, chief statistician, in charge. George J. Lawrence will have immediate charge of the construction survey as chief of the construction census.

Soil-Loading Machine Tests —A Correction

The following corrections should be made in the soil-loading machine article published in our issue of Dec. 5. On p. 785 the first sentence of the last paragraph should read, "The cost of the universal soil-loading machine was slightly more than $1,800, including labor and materials." This is consistent with the total cost of the apparatus of $3,100 as stated in the article. On p. 786, the last paragraph of the article should read, "This article is a condensation from an extended paper presented to the Boston Society of Civil Engineers at a recent meeting."

Book Reviews and Notes

A Monthly Commentary on Current Additions to the Civil Engineer's Library

A New Journal

THE JOURNAL of the Institution of Civil Engineers made its first appearance on Nov. 15. It will, according to the foreword, maintain the continuity with *Proceedings* which have been published regularly for the last 98 years, following on the earlier *Transactions*, which were published from 1836 to 1844. Its purpose is to make available to the members the papers read at "Ordinary Meetings" and the discussion of them at an earlier date than has heretofore been possible. The JOURNAL also will be used to publish "Sessional Notices," reports of the work of important bodies, such as the recently formed research committee, and will record the principal work of the local associations. Eight numbers will be published each year. In form the new journal continues the small size (8½ x 5½) of the other publications of the Institution, instead of going to the larger size adopted for similar journals in this country.

Building Specifications

SPECIFICATION DOCUMENTS for Building Materials and Construction—Classified and arranged by David H. Merrill and Theodore C. Combs; 6x9 in.; pp. 522; tables, photographs and numerous line drawings. Published under direction of Pacific Coast Building Officials Conference, Los Angeles, Calif. Cloth, $5; fabrikoid, $7.50.

UNDER THE UNIFORM BUILDING CODE of the Pacific Coast Building Officials Conference, said to have been adopted by some 150 cities and counties in seventeen states, the technical and legal requirements necessitate a great increase in the use of standard specifications, especially in filing and recording them with local public authorities. To meet this condition, the Conference has prepared the present book, which is a collection of standard specifications approved by various technical organizations. They include not only the materials but also specifications for tests—both chemical and physical—as to the quality of the materials. This collection, covering about 230 pages, is supplemented by about 200 pages of safety regulations for fire protection of buildings and the storage of inflammable materials. Little or nothing is given as to masonry, stone, foundations, waterproofing (except for roofs) or flooring. And only asphaltic felt and cedar shingles are given for roofing. On the other hand, steel for bridges is included, as well as gravel (but not stone or other paving material) for roads. Except for a brief preface, the book consists entirely of this reprinted matter, brought together for the convenience of the user of the several specifications.

Engineering and Geology

A COMPREHENSIVE TREATISE ON ENGINEERING GEOLOGY—By Cyril S. Fox, Calcutta. Cloth; 6x10 in.; pp. 392. Photographs, diagrams, tables. Published by The Technical Press, Ltd., London, and D. Van Nostrand Co., Inc., New York, N. Y. $7.50.

A BROAD SCOPE has been chosen by the author of a new text on engineering geology, and his treatment of the subject is rather random, as illustrated by the inclusion of retaining-wall and earth-pressure formulas, and various tables of physical constants, as well as several chapters on water supply. Data and illustrative cases are largely taken from India.

About one-third of the book deals mainly with petrography and building materials; another third treats of earthquakes, landslips, rock excavation, retaining walls and foundations; and the final third of the book treats of hydrology, water supply and canals. Water quality has a chapter of its own in last section.

One feature that distinguishes the book from many others is a group of excellent microphotographs of rock sections. A large part of the text consists of citations, including a full-page quotation from a newspaper account of the recovery of gold from a sunken steamer. The book is evidently designed more for European and Indian than for American readers, though it contains points that will be found useful in this country as well.

Miscellaneous Notes on Booklets and Reprints

STRESS CONCENTRATIONS at fillets, holes and keyways as found by the plaster-model method are described in Bulletin 276, Engineering Experiment Station, University of Illinois, Urbana, Ill. Price, 40c.

DATA ON LANDSLIDES, subsidence and rockfalls, collected by George E. Ladd, consulting engineer-geologist, U. S. Bureau of Public Roads, have been published by the American Railway Engineering Association, 59 East Van Buren St., Chicago, Ill., as Bulletin No. 377.

HIGHWAY ACCIDENTS IN NORTH CAROLINA and guides to safety are the subjects of Bulletin No. 9, Engineering Experiment Station, North Carolina State College of Agriculture and Engineering, Raleigh, N. C. Copies free upon request.

THE STATUS OF THE PROGRAM being developed by the Metropolitan District Water Supply Commission of Massachusetts is presented in the commission's 9th annual report (Massachusetts Public Document No. 147), which also includes a record of expenditures from the date of appointment of the commission in 1926.

New Books and Revised Editions

[Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.]

AMERICAN SEWERAGE PRACTICE, VOL. III, Disposal of Sewage, Third Edition—By Leonard Metcalf and Harrison P. Eddy, revised by Harrison P. Eddy. Cloth; 6x9 in.; pp. 892; Illustrated. Published by McGraw-Hill Book Co., New York and London. $7.

AMERICAN PLANNING AND CIVIC ANNUAL—Cloth; 5x8 in.; pp. 356; illustrated. Published by American Planning and Civic Association, Washington, D. C. $3. . . . *Contains the proceedings of the 1935 Conference on City, Regional and National Planning and addresses at the 1935 National Conference on State Parks. Previously published as an annual under the title American Civic Annual.*

BUILDING RESEARCH BOARD, Report for the year 1934—Paper; 6x10 in.; pp. 164; illustrated. Published by His Majesty's Stationery Office, London. Price, 6s 3d.

HOME OWNERS HAND BOOK—By C. B. Smith. Paper; 8½x12 in.; pp. 255 including advts.; illustrated. Published by Housing Publications, Inc., 25 W. 43rd St., New York.

IF YOU ARE GOING TO DRIVE FAST—By Ray W. Sherman. Cloth; 5x7½ in.; pp. 149. Published by Thomas Y. Crowell Co., New York. $1.

MARINE PILING INVESTIGATION, New England Committee, Progress Report, 1934-1935—Published by New England Committee on Marine Piling Investigation, Care B.&M.R.R., 150 Causeway St., Boston, Mass. $1.

RESISTANCE OF PILES TO PENETRATION—By Russell V. Allin. Cloth; 6x9 in.; pp. 130. Published by E. & F. N. Spon, Ltd., London, Engineers Book Shop, 165 E. 46th St., New York. $4.

RESULTS OF MUNICIPAL LIGHTING PLANTS, Fourth Edition—Paper; 6x9 in.; pp. 185; Compiled and published by Burns & McDonnell Engineering Co., Kansas City, Mo. $1. . . . *A tabular record of lighting plants in 145 cities under municipal ownership.*

ROAD AGGREGATES, Their Uses and Testing. Vol. III, The Roadmakers' Library—By Bernard H. Knight. Cloth; 6x9 in.; pp. 264; illustrated. Published by Edward Arnold & Co., London, and Longmans, Green & Co., New York. $8.

THE STORY OF TELFORD, The Rise of Civil Engineering—By Sir Alexander Gibb. Cloth; 6x8¼ in.; pp. 357; illustrated. Published by Alexander Maclehose & Co., London. 16 shillings.

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A Year of Growth

AS THE OLD YEAR ENDS, the figures show that the remarkable 1935 rise in private construction continues without a break. Both industrial and residential construction nearly double their 1934 levels. These fields not only furnish the bulk of normal construction activity but also control in importance because they reflect the transformation of savings into productive wealth—the governing mechanism of business. Thus the present rise expresses a new spirit of individual initiative to make up the deficit in construction that accumulated during half-a-dozen years. We may fairly conclude that the outlook for the coming year is promising, since the momentum of new enterprise, a rebound after extreme repression, is a continuing force. It is unnecessary to say that this means much for engineers and for all the interests and industries that participate in construction. All of them have reason to look forward to a new year distinctly happier than those of the recent past.

For Better Service

THE PUBLICATION of a regular series of interpretative notes on advances in sewage disposal that begins in this issue is planned to aid workers in the field to keep abreast of new knowledge on the sanitary science and art. Few fields of civil engineering are developing as rapidly, and in few does sound engineering depend so directly on adequate dissemination of the results of research and operating experience. Methods and the mechanism of sewage treatment are by no means completely understood and fully established; the next decade, it is safe to say, will bring wide changes in both theory and practice. To realize the rapidity of change we need but recall the hit-or-miss status of separate sludge digestion in 1925 and its subsequent developments. The problems are multiplying, however; even activated-sludge treatment remains little understood. It is our hope, therefore, that all significant items of new knowledge can be made quickly available to the whole profession, in order that the art may return a better service.

Highway Terminals Again

THE PROBLEM of highway entrances into cities that was discussed in these pages last week in connection with the new Oakland express highway in St. Louis has direct application to the latest link in the Long Island parkway system, described in this issue. The Interborough Parkway will, in conjunction with the branch to the Triborough Bridge, provide a bypass into Brooklyn around Manhattan. It will also bring traffic into Brooklyn from Long Island over an express highway, in contrast to the narrow winding roads heretofore used. Conversely, traffic from Brooklyn is served whether bound north of Manhattan or eastward to Long Island. However, these fine facilities begin right at the edge of Brooklyn and so, like the St. Louis express highway, do not deliver traffic to its ultimate distribution area. To complete the solution will involve extremely large expenditures. This new parkway thus sets a new and difficult problem at the same time that it solves many others in a manner creditable to those who built it.

Drill Bits

AFTER YEARS of progressive development the detachable rock-drill bit has reached an accepted place in drilling equipment. Under most drilling and rock conditions it has demonstrated an economic advantage over the conventional forged bit, as is indicated in the reports published in this issue covering experiments at the Norris Dam quarry and at three mines. Successful as these trials may have been, however, the full possibilities of the detachable bit have evidently not yet been realized. Bit designs are under constant improvement, and weaknesses revealed in past use are being corrected. The greatest need of improvements, perhaps, is in the metallurgy of both the bit and the rod that carries it. Metal compositions and treatments developed by experience for bit-and-rod combination may not be the best for small removable unit or the best for a drill rod alone. The possibilities of alloy metals for this use have not, as far as we know, been fully explored. When the detachable bit reaches perfection it may revolutionize the rock-drilling process.

The Genius

OUT OF THE BUNGLED MESS of the relief-works program will arise, here and there, a new type of genius. He will be the contractor who bids under his hungry competitors for a relief-works job, somehow meets the stiff requirements for a 100 per cent bond, carries the work to completion amid the greatest array of restrictions and regulations ever imposed upon a major industry, and finally escapes with his whole hide. His trials and tribulations will have been many. Perhaps he will have completed the work largely by hand-labor methods within a prescribed time limit that would have pushed a fully mechanized job; perhaps he has gone to the woods and pits for his timber and aggregates; and probably he will have supplied stipulated thousands of excessive man-hours of employment and escaped the heavy penalty for failure to do so. He will have correctly guessed the uncertain cost of using relief labor, he will have remembered to include in his bid new taxes on materials and payrolls, and he will have survived the nightmare of filling out queer and endless records, reports and statements. If he successfully dodged all the pitfalls of a relief-works project, this contractor deserves to be admitted to the ranks of the great.

Lower Financing Costs

THE OFFER of the RFC to take $100,000,000 of 4 per cent bonds, in order to enable the Great Northern Railway to refund an issue of 7 per cent bonds after private bankers had asked for 5 per cent bonds plus $1,000,000 for underwriting, is indicative of the pressure that the Administration is making to bring down interest rates on high-class securities. It is significant also of current movements to abolish traditions that have long been a burden on the economic organization of industry, no-

where more seriously than in respect to the railroads. From the construction viewpoint the action is interesting because of its possible repercussions on the financing of new corporate work, for any reduction of financing costs will advance the range of economic feasibility, and so will stimulate construction.

What The Art Has Gained

WHEN CONTROVERSIES arise over surety bonding of construction contracts, as they recently did in New York, it is easy for a belief to gain ground that the contract bonding system is an unnecessary and a parasitical device. It was not many years ago, for example, that a prominent public official, upon reviewing the accomplishments of a number of years of construction operations in his state, drew attention to the volume of construction completed without a contract default, and pointed to the total cost of bond premiums paid during that time as wasted expenditure. He was sincere, and his statement received much public attention. Yet it was gravely misleading, for it ignored the vital public interest in efficient surety protection.

What surety bonding has done to cheapen routine construction and eliminate the gambling inseparable from localized hazard through spreading the risk is too well known to need restatement here. In this effect alone the surety system fully justifies its existence and claims place as an essential part of a sound construction system. But corporate surety bonding has even greater importance in its relation to major construction undertakings. In its influence upon these, indeed, it has been a power in extending and advancing the construction art.

Only the support of the corporate surety system made it possible to undertake large and difficult works of construction as regular day-to-day matters rather than as rare and infrequent ventures. In the earlier days any major enterprise involved difficulties and hazards that could not be faced by the individual contractor unless his own resources and the faith and support of his friends were so great as to enable him to take the risk. Since few great construction operations are without an element of risk that may turn the best construction plan and the most experienced and careful foresight into failure, it is plain that the art could make but indifferent progress until a system was devised by which the risk could be carried in a sound businesslike way. The corporate surety system does just this, and correspondingly it has aided the progress of engineering.

If one looks back over the construction achievement of the four or five decades since the contract bonding system began to evolve, its beneficial influence is clearly apparent. Major public-works construction grew greatly, and a record of success in the accomplishment of large and ever more difficult undertakings was compiled that reflects the advancing powers of the construction art. This advance did not come about through experience and improved method alone; these in themselves resulted from actual work on difficult projects that would hardly have been ventured on personal surety of the old-time kind.

From the record, in short, the influence of organized contracting and organized corporate suretyship in cooperation can hardly be misappreciated. And let it be remembered that the evolution of competently organized contracting itself was in large measure made possible by the development of an adequately organized surety system. Thus the corporate surety plan may not unfairly be credited with playing a fundamental part in that astonishing progress of the construction art which marks the current century's history.

It is such facts as these that should be remembered when local troubles and complaints threaten to cast discredit on bonding. If they are fully understood, they will lead to determined effort to remedy any weaknesses or abuses in the application of the system, but they will warn us that we should seek at all costs to preserve it as an essential part of modern construction procedure.

Safe Road Requirements

DISCUSSION of the safety of the road by highway officials at their recent annual convention at Miami pointed clearly to the intense and universal interest that this subject engages today. The men who administer federal and state highway departments feel keenly the call for action to reduce the hazards of road travel, though they do not yet know how to act. This uncertainty grows out of the fact that the road even now is thought of as a physical structure rather than as an operating tool, and in consequence the full engineering service in respect to the road has been only partly accomplished. This situation has come about logically enough, but just as logically the time is now at hand for new planning.

The lack of formulated thought on highway operation is particularly evident in respect to safety. Accident figures are produced and quoted endlessly, but hardly any such data are of a kind to enable the road engineer to determine the reasons for accidents except by roughest extrapolation. So we have assumption and opinion occupying the place of engineering analysis, and opinion veering from reform of driver habits to control of travel speeds by mechanical governors. The problem will not be solved by such naive expedients; it will be solved only when accident records give the source causes of accidents and show the way to effective remedies.

Even were causes known, there is today no organization to direct operations with a view to eliminating them. Machinery for driver education and control (and as final resort punishment) exists in only part of the states, and there is only partly operative. An operating department is as essential to the administration of public highway systems as are construction and maintenance departments; yet no state has even the semblance of such an agency.

With reliable accident information and operating organization there remain to be developed the principles of road design and construction for safety and transportation efficiency—the adaptation of the road structure to travel objectives and speeds. It cannot longer continue to be proclaimed that only certain speeds may be attained in highway travel; instead the traveler's demands must be served by the road as they become important enough economically or socially to justify service.

Safety on highways, a complex adjustment of structure and traffic to eliminate hazards, calls for a new conception of road transportation service. A coordination of engineering planning and traffic management is required that does not now exist. Road safety cannot be secured by any patching process applied to obsolete roadbuilding and travel standards.

CURRENT NEWS

Engineers Report On Power Projects In Nebraska

PHYSICALLY sound but economically doubtful unless combined into a single power-marketing entity is the verdict returned by the committee of five engineers appointed by PWA Administrator Ickes to report upon the Sutherland, Columbus and Tri-County power and irrigation projects in Nebraska. The committee was composed of the following: Elwood Mead, Commissioner of Reclamation; J. D. Ross, Securities and Exchange Commission; H. V. L. Wright, consulting engineer for the Wrigley estate; George F. Harley, PWA Engineering Division; K. Sewell Wingfield, assistant director, PWA Power Division.

Integrated control needed

Individually organized as public districts, the three projects studied are territorially distinct as regards irrigation but co-extensive as regards power markets, thus creating a potential competition that might affect power revenues seriously and threaten the financial stability of one or more of them. Inherent weaknesses in the present set-up of PWA engineering supervision is also pointed out in the report, which recommends the creation of a centralized agency to (1) supervise construction for PWA; (2) take over the electrical features of the three projects and function as a central marketing agency; (3) apportion net revenues to accord with the financial necessities of the projects. It is recommended that the head of the agency be appointed by PWA, have no local affiliations, act as resident engineer for the three projects and have full authority.

The three projects would provide for the ultimate irrigation of 600,000 acres of land and generating capacity totalling 136,000 kw. capable of producing 450 million kw.-hr. annually. Full efficiency cannot be obtained without further regulation of the North Platte River by means of additional storage facilities not contemplated in any of the present developments. Planning of transmission facilities has been left, for the most part, to the future and the committee feels that best results will be obtained by divorcing this phase from all of the projects and placing it in the hands of the centralized marketing agency.

$15,000,000 for transmission lines

It recommends the construction of three 115,000-volt lines extending from the western development to the consuming centers in the eastern part of the state, and tying in by not less than two independent lines each of the intervening generating plants. Important load centers would be tied in by loops permitting service from two directions to ensure continuity of service. The cost of such a distribution system is estimated at $14,000,000.

The committee found that much of the design work is still in the preliminary stage because of uncertainty as to how much PWA money would be made available. The state PWA agency, because of the number of small local projects requiring its attention, has not been able to give detailed field supervision to the three projects, nor prompt approval to the various steps of design and construction. Since the three projects are of large proportions and present similar problems, the committee feels that they could profitably be separated from the remainder of the state PWA program and placed under a single head.

The three projects

Aspects of the report referring to individual projects are as follows:

Platte Valley Public Power and Irrigation District (Sutherland Project).—This project comprises a diversion dam in the North Platte River together with canals and supplementary storage for the irrigation of 100,000 acres of land downstream from the town of North Platte. An immediate installation of 25,000 kw. generating capacity is included, with an ultimate increase to 37,500 kw. Plans include a transmission line to the Columbus project. Construction work on this project is about 75 per cent completed.

Loup River Public Power District (Columbus Project)—This is a stream-flow hydro-electric development on the Loup River near its junction with the Platte River. No irrigation is involved. There will be two plants, one near Monroe and one near Columbus. The former will have an installed capacity of 7,500 kw.; the latter 39,000 kw. The latter will have 5,000 acre-ft. storage capacity. Design of desilting works is not yet complete. Total PWA allotments to date: $8,700,000. Contact awards, Oct. 1: $4,428,000.

Central Nebraska Public Power and Irrigation District (Tri-County Project)—This project is still in the design stage. It contemplates the ultimate irrigation of 500,000 acres and the generation of 52,000 kw. of power. The principal problem is the provision of 1,500,000 acre-ft. of storage above the point of diversion on the Sutherland project. Additional surveys are needed before the dam can be located and designed, but it is the opinion of the consulting board that a suitable site can be found and developed. The board also favors the ultimate construction of an additional reservoir, but feels that this item should be deferred until needed.

Financing of the projects

The financial status of the Nebraska developments is as follows:

	Board's estimate of approx. immediate construction cost	PWA allowance
Sutherland	$8,200,000	$9,700,000*
Columbus	8,800,000	8,700,000**
Tri-County	25,000,000	10,000,000
Transmission system	14,000,000	0
Total	$56,000,000	$28,400,000

*Includes $1,500,000 for transmission lines.
**Includes $1,200,000 for transmission lines.

Road Builders Plan Discussions Of Current Problems

A COMPREHENSIVE program covering items of interest to highway engineers and builders has been planned for the American Road Builders convention to take place in Cleveland, Ohio, from Jan. 20 to Jan. 24, 1936. An exhibit of road construction equipment and materials will be run concurrently with the convention.

The convention will open with a meeting of the board of directors on Monday morning, and in the afternoon a general open session will discuss federal highway appropriations and national highway legislation. The following day there will be four morning sessions covering the general topics of farm-to-market roads, planning, general technique and highway contracting. During the afternoon there will be a continuation of the general technical session, an educational session and a Pan-American session. On Wednesday morning the highway contractors' session will be continued as well as the general technical session, and a city officials' session.

City and county work

Both the municipal officials and county highway officials will have a session during Wednesday afternoon and a general session will be held. On Thursday morning the county highway officials' session will be continued and there will be a meeting of the board of directors of the Manufacturers Division, which will be followed by a joint meeting of the Board of Directors and the Manufacturers Division. Thursday afternoon will be devoted to a National Highway Advisory Council session which will discuss a plan for continuing the highway program. This will include a review and appraisal of the highway program to date, the need and advantages of continuing this program and possibilities of federal aid to cities and counties.

Among topics that will be discussed at various sessions are a symposium on the stabilization of soil and gravel roads, government trend in hand labor and machinery requirements, highway economics, highway construction in Mexico, the effect of government regulations on cost of work. There will also be included a symposium on concrete expansion and contraction joints.

Dinner For E. S. Nethercut

A dinner will be given Edgar S. Nethercut, secretary-emeritus, on Jan. 6, by the Western Society of Engineers, Chicago, Ill., in recognition and appreciation of his long service to the society. The dinner is sponsored by the past presidents of the Western Society of Engineers and will be attended by members and others of Mr. Nethercut's friends. Mr. Nethercut was elected secretary-emeritus on Sept. 1 (*ENR*, Sept. 12, 1935, p. 382).

Labor Relations Act Held Unconstitutional

The National Labor Relations Act was held unconstitutional in a decision handed down by Federal District Judge M. E. Otis, in Kansas City, Dec. 21. The suit, which was the first concerning the Wagner labor relations act, was brought by the Majestic flour mill, Aurora, Mo., asking a temporary injunction enjoining representatives of the regional and national labor relations boards from interfering with the labor management of the mill.

In his ruling Judge Otis declared, "Manufacturing is not commerce nor any part of commerce. Nothing more firmly is established in constitutional law than that Congress, therefore, under the commerce power, cannot regulate manufacturing as commerce. Never can these relations be any part of commerce."

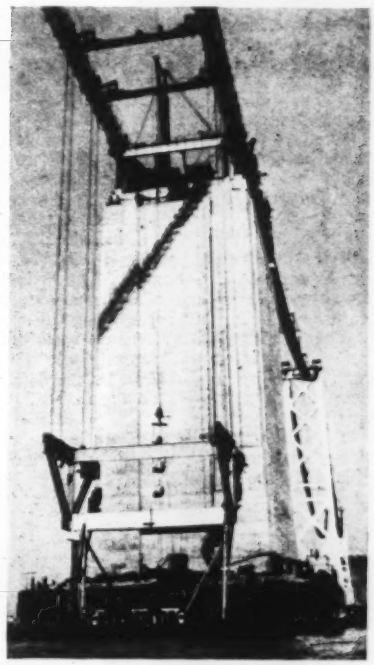
The opinion further held that it is absurd to say that the refusal of the owner of a flour mill to bargain collectively with his employees directly affects commerce among the states and that since manufacturing is not commerce, it is inaccurate to say that under the commerce clause, which gives Congress the power to regulate commerce with foreign nations and among the several states and with the Indian tribes, that Congress can regulate that which, not itself a part of commerce among the states, directly affects the commerce. It is only when something outside of commerce actually impinges or is about to impinge on commerce that it can be reached by the power of Congress. The impingement may be prevented, for that is a regulation of commerce, but what goes on before and outside impingement or the spread of it, is beyond the power of Congress.

Commerce not affected

The court further stated that there is no way, and that the defendants point to none, in which any of the specified unfair labor practices in any business, whether mill or mine or factory or store, conceivably can directly affect, by burdening or obstructing commerce. Here again the suggestion, the only suggestion, is that unfair labor practices will result in discontent, possibly in strikes, hence in limitation of production, and thus in lessened commerce. But, held the court, that is affecting commerce only indirectly and remotely.

The district court judge cited the Supreme Court as deciding that Congress may regulate that which is in a stream of commerce, but that the flour mill, which purchased wheat in Kansas, its subsequent milling in Missouri, and a final sale in some other state, was not a stream of commerce. The court said, "Here are two distinct streams of commerce, one ending when the wheat is unloaded at the mill, the other beginning when the flour into which the wheat has been manufactured is loaded on cars for shipment." The mill is at the end of one stream and at the beginning of the other, but not a part of either. The court held, then, that the possibility of strikes at the flour mill in no way could affect interstate commerce.

Thus holding that the refusal by an employer to bargain collectively with his employees would constitute no evidence that the employer's intention was to lessen commerce. Judge Otis granted a temporary injunction against the National Labor Relations Board to the owners of the mill.



RAISING FIRST DECK STEEL FOR SAN FRANCISCO BAY BRIDGE

Stiffening-truss and floorbeam erection on the San Francisco-Oakland Bridge was started last week, using a procedure new to large suspension-bridge enterprises. It involves assembling one or two stiffening-truss panels and the corresponding upper and lower deck floorbeams into a unit at the storage yard, floating it to the bridge and hoisting it into place 200 ft. above San Francisco Bay. The full-deck sections are 66 ft. wide, and the maximum length of an erection pick will be 90 ft. The weights of the picks will vary from 50 to 210 tons. The view shows the first section in the west suspension bridge being raised adjacent to the central anchorage.

The raising frame is suspended from carriages that travel on the 20-in.-diameter cables. Hoisting engines are placed on the fenders at the base of the main towers, and deck erection will be carried on simultaneously from the ends of the side spans toward the towers and both ways from the center of the main span toward the towers. By this procedure both tower deflections and cable distortions will be reduced to a minimum.

The erection procedure was developed by the American Bridge Co., the contractor. Model studies formed a part of the development work, one of the steel models built as a part of the early design investigations being loaned to the contractor for the purpose by the engineers.

Radio Conference To Discuss Construction Industry

A radio conference of building material dealers, contractors, builders and architects will be sponsored by Johns-Manville on Jan. 13, 1936. The radio conference will bring as speakers George LaPointe, president, National Retail Lumber Dealers Association; Stewart McDonald, Federal Housing Administration; Robert V. Fleming, president, American Bankers Association; Stephen F. Voorhees, president, American Institute of Architects, and Lewis H. Brown, president of Johns-Manville.

California Water District Considers Cities' Applications

The board of directors of the Metropolitan Water District of Southern California has announced the appointment of a special Water Problems committee to consider the applications of unincorporated cities and sections of highly developed horticultural areas now outside the district to participate with present Metropolitan Water District cities in the benefits of water from the Colorado River aqueduct. Franklin Thomas of Pasadena, vice-chairman of the board, is chairman of the new committee. Other members are: John R. Richards of Los Angeles; J. H. Ramboz of San Marino; Victor Rossetti of Los Angeles, and S. J. Finlay of Santa Ana, all members of the district board.

Communities which have opened negotiations with the district asking information on the possibilities of securing aqueduct water include: Hermosa Beach, Elsinore, the foothill area from Covina to Uplands and south to Pomona and Orange County water users in unincorporated areas. Terms upon which areas needing Colorado River water will be admitted to the group securing aqueduct water are now being studied by the committee.

One of the basic problems being considered is how far the cities already in the district can permit extension of district boundaries, according to W. P. Whitsett, chairman of the board. The entire capacity of the aqueduct is now shared on a pro rata basis by present member cities, and any extension of district boundaries will reduce quantities of water to which present members are entitled.

Southern California cities now in the Metropolitan Water District are: Anaheim, Beverly Hills, Burbank, Compton, Fullerton, Glendale, Long Beach, Pasadena, San Marino, Santa Ana, Santa Monica, Torrance and Los Angeles.

Little Rock, Ark., Gets Funds Realloted For Water Supply

Approval of three allotments, totaling $7,364,400 from old PWA funds, to Detroit, Mich., Brewton, Ala., and Little Rock, Ark., has been announced by the Public Works Administration.

Allotment of a loan and grant of $7,074,500 was made to Little Rock for a new water system. A previous allotment of $3,080,000 had been made to the city and the city had been negotiating with the Arkansas Water Co. for control of the company's distribution system (*ENR*, Dec. 5, 1935, p. 794). This allotment was subsequently rescinded when the city failed to make an agreement with the water company which was agreeable to PWA. Details concerning the reallotment of a larger sum have not yet been released.

Detroit was awarded a grant of $238,100 for extensions and improvements of its municipal electric distribution system. No loan was requested. The project calls for the construction of eight miles of 24,000 volt overhead lines, four miles of underground conduit, fifteen miles of cable and one sub-station.

Brewton, in order to build a Butane-air gas plant and distribution system, was awarded a loan and grant of $51,800 from old PWA funds.

Constricted Channel Causes High Flood After Record Rainfall At Houston

A MAXIMUM FLOOD of roughly 55,000 sec.-ft. poured down Buffalo Bayou through Houston, Tex., Dec. 8 and 9, reaching stages 7 ft. higher than the 1929 flood, which was considered the maximum up to that time. The waters flooded the Farmers market on Preston St. 5 ft. deep and carried away a number of bridge railings and earth at approaches to bridges, but did not destroy any of them. One abutment has since settled vertically a number of feet in a peculiar manner indicating undermining. The bridge pier is supported on piles. The trouble appears to have been due to constriction of the stream channel by bridges and buildings.

Buildings collapse

Six major buildings along the channel have collapsed in whole or in part, largely due to undermining of foundations by back eddies. One building with the foundation gone at one corner and essentially so all along one side has bulged out at the top but apparently is supported by the cross walls and floors. It has been condemned by a board of engineers, including J. M. Nagle, director of public works, H. F. Jonas and R. J. Cummins. The board is expected to condemn other structures before its examinations are completed.

Pavements on several streets were lifted and floated away. Apparently this lifting was caused by entrained air as the damage was not at points where the current was swift.

Plans for removing constrictions to care for a hypothetical flood slightly larger than this one were partially worked out in 1932 and 1933, but were not completed. At present the city and county authorities and their technical staffs are attempting to reach an agreement as to a physical solution of the problem and a method of financing the work required in removing encroachments. Construction of bypass channels around the city to Clear Lake and thence to Galveston Bay has been proposed as an alternative to improving the present channel. Shipping interests would appreciate the bypass channel since some 600,000 yd. of silt was deposited in the ship channel and will have to be dredged out.

The flood stage at Houston was raised by high tides backing up the water, also by flood-water carried into the channel by San Jacinto River.

Estimates of damage range from below $1,000,000 by a conservative engineer to around $2,000,000 claimed by newspapers. Costs of removing restrictions and right of way range from $6,000,000 to $10,000,000. The PWA staff attempted to promote a program to care for the stream at one time but its efforts came to naught. Formation of a drainage district covering the county is under serious discussion, since this will permit expenditures free from the bond limit of the city.

The rainfall which caused the damage ranged from 6 in. in Houston to 20.8 in. near the center of the 406-sq.mi. watershed. It fell within a 42-hour period and roughly amounted to an average runoff intensity at the peak of 135 sec.-ft. per square mile.

MILAM ST. BRIDGE, Houston, after the flood had subsided. At the peak of the flood water reached the awnings on the General Electric warehouse. A one-story building on the waterfront adjoining the ice plant collapsed during the flood.

AT THE FRANKLIN BRIDGE a back eddy undermined and caused the collapse of parts of the buildings of the Dixon Packing Co. and the Houston Ice & Brewery Co. Trusses at the right are not from a collapsed building; they were in storage at that point.

Ontario Negotiates Contracts For Electric Power

New contracts for the purchase of electric power have been negotiated by the Ontario Hydro-Electric Power Commission with the Gatineau Power Co. and the Maclaren Co. Subject to approval by the provincial cabinet, the commission has agreed to take 140,000 hp. from the Gatineau Power Co. under two separate contracts. One contract calls for 100,000 hp. to be supplied to the province's Niagara distribution system and 40,000 for its Eastern distribution system. The commission expressed its willingness to contract with the Maclaren Co. for 40,000 hp. The new contracts, which will be binding for ten years, after which they may be terminated by either party on two years' notice, call for a price of $12.50 per horsepower. The contracts make provision for reserve power, with the commission paying a reservation cost of $1.75 per horsepower.

Extension to New York's Subway To Be Opened in January

Another link in New York City's independent subway system will be put into operation on Jan. 1, with the opening of the Houston-Essex Street line. The new section will branch off from the present line at the West 4th St. station and run east along Houston St. with stations at Lafayette St. and 2nd Ave. From here the line will run downtown on Essex St. to the terminal at East Broadway and Rutgers St. It is planned to have the Houston-Essex St. line under the East River to the Jay-Smith-Ninth St. line in Brooklyn ready for operation next summer. The new line was built at a cost of about $17,300,000, which does not include the cost of acquiring land.

Rio Grande Compact States Request Water Resources Study

A request that the National Resources Committee, through its Water Resources Committee, undertake an investigation of the water resources of the Rio Grande Basin was made at a meeting of the Rio Grande Compact Commission held in Santa Fe, N. M., on Dec. 2-3. The survey is to be limited to the collection, correlation and presentation of factual data to aid the states of Colorado, New Mexico, and Texas in reaching an equitable apportionment of the waters of the Rio Grande Basin above Fort Quitman, Tex.

The report of the investigation is not to contain recommendations but is to indicate through basic data the water resources of the Rio Grande, the past, present and prospective uses and consumption of water in the basin and opportunities for conserving and augmenting the water resources by all feasible means.

The conference was called as the result of a request by the Water Resources Committee to discuss the advisability of such an investigation and partially as a result of a letter from President Roosevelt to all authorities having the power to approve applications for allocation of federal funds for the construction of water conservation projects in the Rio Grande Basin, instructing them to withhold approval of such applications until they were approved by the National Water Resources Committee as it was feared that further diversions and use of the water might impair the present federal investments there.

M. C. Hinderlider, interstate river commissioner, represented Colorado at the meeting. New Mexico and Texas were represented by Thomas M. McClure and Frank B. Clayton, Rio Grande Compact commissioners for the respective states. The federal government was represented by S. O. Harper, chairman of the Compact Commission.

Army Engineers to Survey Old Hennepin Canal

Under the direction of Maj. Earl E. Gesler, army engineer in charge of the Rock Island District office, a survey has been started to determine the cost of modernizing the Illinois and Mississippi barge canal as part of the nine-foot channel program for the Upper Mississippi River.

The work is being financed with funds provided by Congress in the last Rivers and Harbors Act and is expected to cost about $75,000, and to require one year for completion. Among other things, the survey will include topographic and hydrographic mapping, explorative borings, analysis of probable traffic, and a study of the water requirements and design problems.

The Illinois and Mississippi Canal, known locally as the Hennepin Canal, was completed about 40 years ago at a cost of $7,224,000. It is 75 mi. long, providing a seven-foot channel from Rock Island, Ill., on the Mississippi River to Bureau, Ill., on the Illinois River. Although the canal provides a 190-mi. barge line from the Rock Island-Davenport area to Chicago, it is little used because of the small locks and the low clearance of bridges. Thirty-two locks, 135 ft. long and 35 ft. wide, were built along the canal. These are all hand operated and are too small for passing the modern barges used on the Upper Mississippi where the standard lock now being built is 600 ft. long and 110 ft. wide. Barges from Rock Island to Chicago could save almost 400 mi. by using this canal.

Chesapeake-Delaware Canal Widened for Coastwise Ships

Transformed a decade ago from a small canal with locks into a sea level canal of 12 ft. depth and 90 ft. bottom width, the Chesapeake & Delaware Canal which cuts across the 14-mile strip that separates the heads of Chesapeake and Delaware bays, is now undergoing a further change to give it a depth of 27 ft., a bottom width of about 135 ft. and a surface width of 250 ft. The present program is being undertaken to serve large freight ships and naval vessels which must now traverse the much longer and more hazardous open sea route between Norfolk and Philadelphia.

The canal was purchased by the federal government in 1919 after a century of service beginning four years after the opening of the Erie Canal. The initial widening involving 16,000,000 cu.yd. of dredging was described in *ENR*, Oct. 29, 1925, p. 702. The five major lift bridges built at that time were designed to serve the future and deeper canal that is now being constructed. Contracts were awarded in August by the Corps of Engineers for $2,136,689 worth of wet excavation and $846,707 worth of dry excavation. Typical operations of this dry work are shown in the photograph. Firms holding contracts at present are: wet excavation; Atlantic Gulf & Pacific Co.; Arundel Corp.; and Continental Dredging Co.; dry excavation: Edward H. Ellis, Inc., Westville, N. J.; Burket Construction Co., Philadelphia, and Richards-Kelly Construction Co., Philadelphia. Of the total dry excavation, 3,000,000 cu.yd. will be taken out in one four-mile stretch of the canal. The PWA allotment for the work is $5,107,000, and additional contracts are in prospect.

Most of the dry excavation, which involves a total of 4,440,200 cu.yd. of material, will be taken from only one side of the canal as is shown below.

EXCAVATION work along the Chesapeake-Delaware Canal.

Pennsylvania Begins Work of Acquiring Toll Bridges

Acting under a state law passed in 1927 providing for the purchase or condemnation by the state of privately owned toll bridges, the state of Pennsylvania has moved to acquire five bridges.

Under the law, acquisition of the bridges is to be financed by a bond issue. When the state has taken title to the bridges, the tolls will be continued to pay maintenance charges. When the bonds have been retired, the bridges will become toll free.

The secretary of highways has made offers to the owners for acquisition of the bridges as follows: Market St. bridge, Harrisburg, $1,501,000; Clark's Ferry bridge, $475,000; Sunbury bridge, $442,600; Point Marion bridge, $221,000, and West Hickory bridge, $25,000.

Montreal Court Holds Contractor Not Liable for Certain Damage

More than 50 actions, asking settlements running into many thousands of dollars, based on alleged damage to adjoining properties through blasting operations for the new Mount Royal sewer, were affected by a ruling handed down by Justice MacDougall, last month, in a test case against the Belmont Construction Co. Property owners claim that serious damage was caused by heavy blasting. The ruling declared that in cases of municipal works being carried out in the public interest, the property owner must submit to inconvenience and even to damage without compensation, provided such works were executed properly by the contractor.

SOCIETY CALENDAR

AMERICAN ENGINEERING COUNCIL, annual meeting and conference of Secretaries of Engineering Societies, Washington, D. C., January 9-11, 1936.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, annual meeting, Miami, Fla., January 13-15, 1936.

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual meeting, New York City, January 15-18, 1936.

AMERICAN ROAD BUILDERS' ASSOCIATION, annual convention and road show, Cleveland, Ohio, January 20-24, 1936.

CONSTRUCTION EQUIPMENT ASSOCIATION, first annual meeting, Cleveland, Ohio, January 20-24, 1936.

CANADIAN CONSTRUCTION ASSOCIATION, annual meeting, Hamilton, Ont., January 21-23, 1936.

NATIONAL PAVING BRICK ASSOCIATION, annual meeting, Columbus, Ohio, January 29-31, 1936.

ENGINEERING INSTITUTE OF CANADA, annual meeting, Hamilton, Ont., February 6-7, 1936.

AMERICAN SOCIETY FOR TESTING MATERIALS regional meeting, Pittsburgh, Pa., March 4, 1936.

MIDWEST POWER ENGINEERING CONFERENCE, Chicago, Ill., April 20-24, 1936.

NEW YORK STATE SEWAGE WORKS ASSOCIATION, annual meeting, New York City, January 14-17, 1935.

LOUISIANA ENGINEERING SOCIETY, annual meeting, New Orleans, La., January 24-25, 1936.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES, annual meeting, Atlantic City, N. J., February 12-14, 1936.

SOUTHWEST ROAD SHOW AND SCHOOL, Wichita, Kan., February 25-28, 1936.

New Type of Sewage Treatment for New Britain, Conn.

A chemical precipitation plant using the Guggenheim process (ferric hydroxide plus zeolite) is to be built by New Britain, Conn. It has been designed for a capacity of 9 m.g.d., sufficient for the estimated needs of the city until 1950. The main elements of the plant are a mechanically-cleaned bar screen; pre-settling tanks with a detention period of one hour, also cleaned mechanically; special-flow air-agitated flocculation tanks to give 1½ hours of detention at 115 per cent of the designed flow; two-hour detention final settling tanks for the designed flow capacity; automatic chemical-feed apparatus and mixing chambers; vacuum filters; and an incinerator for scum, screenings and sludge. Provision will be made for the use of either quicklime, prestolite lime, chlorinated copperas, ferric chloride or alum.

Sludge from the settling tanks will be recirculated, enough going to the inlet end of the flocculation tanks to maintain the content of solids at about 1,000 p.p.m. and the remainder going to the pre-settling tanks. Sludge from the latter will be pumped to conditioning tanks preceding vacuum filtration.

Adoption of the process by New Britain followed experiments begun about June 1, 1935, with a 100,000 gal. plant built and operated by Guggenheim Brothers, New York City. Negotiations for royalties based on the designed capacity of the projected plant are in progress. Bids for excavation were received on Dec. 10. Contract plans and specifications for general construction work, now being prepared by Fuller & McClintock, New York City, will soon be ready.

Contractors Seek to Extend Dominion Housing Act

Amendments to the Dominion Housing Act, to extend its operations, are to be sought by Canadian construction interests. National Construction Council will make representations to the government to have the legislation apply to modernization work, and also to have lending institutions insured against losses on loans that are advanced.

Designed to stimulate activity in house building, the housing act was adopted at the last session of Parliament. It set up a fund of $10,000,000 from which the Dominion Government was to finance 20 per cent of the cost of new dwellings, the remainder to be provided by the owner and approved mortgage and insurance companies to the extent of 20 and 60 per cent respectively. The latter were limited to an interest and service charge of 5 per cent, and losses were to be assumed 20 per cent by the government and 60 per cent by the lending institution. Renovation projects were not acceptable under the plan.

It is claimed by construction interests that the housing act has not been fulfilling its purpose because of the hesitancy of lending institutions to incur any risk. According to representatives of the National Construction Council, it would probably be more successful if the lending institutions were accorded the protection which they are given by insurance of mortgages under the Federal Housing Administration in the U. S. It is also held that exclusion of renovation projects from the benefits of the act is depriving the construction industry of a large amount of business.

Personals

ROBINSON D. BUCK, formerly connected with the engineering department of the city of Hartford, Conn., has become associated with the firm of Henry Wolcott Buck, formerly Henry R. Buck, Inc.

JOHN P. DEAN, engineer in the St. Louis, Mo., city water department has been appointed acting water commissioner to succeed C. M. DAILY who resigned to enter private business.

H. G. SOURS has been elected to succeed J. O. MCWILLIAMS as chairman of the Ohio state board for the registration of engineers. Mr. Sours was a member of the board in 1934.

S. P. GRAHAM, for the past two years division engineer for CWA and TERA in northern Missouri is now engaged as director of projects and planning, as well as chief engineer in charge of construction for WPA in Missouri division No. 3.

J. A. WALDROP has been named division maintenance engineer at Knoxville, Tenn., to take over the position left vacant by Briggs Smith, who has been made a commissioner of the Tennessee state highway department. W. P. BROOKS, who had been district engineer at Morristown, Tenn., was appointed maintenance engineer succeeding Mr. Waldrop.

H. OAKLEY SHARP, professor of geodesy and railroad engineering at Rensselear Polytechnic Institute, has been made a member of the educational division of the American Road Builders' Association. As faculty representative he will act to further the purpose of the division, which is to promote closer relationship between the highway industry and the educational institutions.

COL. GUSTAVE R. LUKESH, Corps of Engineers, U. S. Army, who has been division engineer, North Atlantic Division, New York, has been appointed engineer of the Eighth Corps Area and transferred to Fort Sam Houston, Texas.

COL. GEORGE R. SPALDING, Corps of Engineers, U. S. Army, has been appointed division engineer of the North Atlantic Division to succeed Col. Lukesh. Col. Spalding has been commanding officer at Fort Belvoir, Va. At the time the Industrial Recovery Act was passed in 1933 he was chosen by Gen. Johnson as one of his principal aides in organizing the public works construction program. Later he was named a member of the special board of public works.

CHARLES F. SCOTT, professor-emeritus of electrical engineering, Yale University, and chairman of the board appointed by Gov. Cross to administer the engineers' registration law in the state of Connecticut, was elected chairman of the Engineers' Council for Professional Development at the annual meeting held in New York, Oct. 8. Professor Scott succeeds C. F. HIRSHFELD, chief of research of the Detroit Edison Co., who served as the council's chairman since its formation.

MILES OGAN, McArthur, Ohio, has been appointed to fill the position of Vinton County surveyor to succeed JAMES REYNOLDS who has resigned.

Obituary

FREDERICK W. MILLS, senior highway engineer of the U. S. Bureau of Public Roads, died Dec. 17 at his home in Washington, D. C. Mr. Mills came to the Bureau in 1918 as assistant highway engineer from the New York state highway department. During the past 20 years Mr. Mills made important contributions to research in highway engineering and wrote numerous articles for technical journals. He was born in Quebec in 1872. In his youth, Mr. Mills served as an officer in the British mercantile marine and later as lieutenant in the U. S. Army. He was graduated from the Leavenworth officers school.

JAMES J. GAILLARD, who for many years had been city engineer of Macon, Ga., died in Dahlonega, Ga., Dec. 17, at the age of 77. Mr. Gaillard was graduated from the North Georgia Agricultural College in 1880, began his engineering work as an instrument man on the Rabun Gap Short Line. R.R. From 1880 until 1907 he was employed as engineer for a number of railroads in the South. He then became chief engineer of the Interurban Construction Co. and the Macon, Americus & Albany Electric Ry. Co. He was then chief engineer of the Honduras Transportation Co., in Central America. In 1911 he became city engineer of Macon, Ga., a position which he held for a number of years, later becoming division engineer for the Portland Cement Association.

CONSTRUCTION STATISTICS FOR THE WEEK

ENGINEERING construction awards for this week total $64,307,000 as reported by *Engineering News-Record*. Although for a short week due to the Christmas holiday this is the second highest, except for last week of any week since October, 1931. The total is made up of private, $7,059,000; public, $57,248,000 of which $17,032,000 is federal and $40,216,000 is state and municipal. Corresponding values last year are: total, $17,143,000; private, $2,823,000; public, $14,320,000; federal, $2,255,000; state and municipal, $12,065,000.

The December volume totals $235,506,000, an average of $58,876,500 per week, the highest rate of awards since April, 1931.

The year's volume totals $1,590,151,000 compared with $1,360,596,000, a gain of 17 per cent.

This week's high volume is due to heavy awards in public buildings and in industrial buildings. The classified totals include: waterworks, $3,451,000; sewerage, $3,540,000; bridges, $7,131,000; streets and roads, $3,630,000; earthwork, irrigation and drainage, $10,598,000; public buildings, $27,333,000; commercial buildings, $1,272,000; industrial buildings, $5,218,000.

The larger awards of the week include: dairy for Sheffield Farms, Richmond Hill, N. Y., $1,000,000; steam-electric power plant, separate contracts, electric generating equipment at West Virginia for Logan-Appalachian Electric Power Co., $3,500,000; main building at State Hospital, Dunning, Ill., $552,000; 24 ward buildings at State Hospital, Manteno, Ill., $2,931,000; school, Boston, Mass., $684,000; hospital wings and administration building, Wallum Lake Sanatorium, Burrillville, R. I., $740,000; South End Junior High School, Newburgh, N. Y., $669,000; city hall, Oklahoma City, Okla., $591,000; group, schools, Toledo, Ohio, $1,014,000; foundations, 62nd St., Housing project, Miami, Fla., $929,000; Stanley S. Holmes Village Housing project, Atlantic City, N. J., $1,191,000; Parklawn Housing project, Milwaukee, Wis., $2,239,000; four schools, Philadelphia, Pa., $1,452,000. Highways by Kentucky, $719,000; bridges by Illinois, $938,000; by New York, $1,542,000. Waterworks and sewers awards include: water system, Cincinnati, Ohio, $405,000; waterworks, Bristol, Tenn., $588,000; Section 7, Detroit River Interceptor, Detroit, Mich., $727,000. Excavation and drainage awards include: Wilton Canal and Willow Point Diversion Canal, East Carroll Parish, New Orleans, La., $547,000; rock and earth filled dams and canals for State Water Conservation Board, Montana, $795,000; Bureau Reclamation Imperial Dam and desilting works on Colorado River, Yuma, Ariz., and Calif., $4,374,000; 5 mi. All American Canal for Bureau Reclamation, Yuma, Ariz., and Calif., $701,000; Tunnels, 3, 4, 5, 6, Casper Alcova Project, Bureau of Reclamation, Wyoming, $795,000; Seminoe Dam and power plant of the Casper-Alcova project, Wyoming, $2,760,000. Unclassified includes: lighting equipment for Independent Subway System, Contract L-80, New York City, $430,000; reconstructing platforms at Commonwealth Pier No. 5, Boston, Mass., $718,000.

New capital for the week consists of: corporate issues, $1,278,000; state and municipal bond sales, $26,045,000, which includes a sale by RFC for $13,180,000 of PWA bonds; PWA allotments of $8,323,000 for non-federal work and $3,936,000 for federal projects, and RFC purchase of Metropolitan Water District bonds, $12,096,000.

Jones and Laughlin Steel Corp. is requesting stockholders to approve the creation of a $100,000,000 first mortgage upon the properties of the corporation and subsidiaries under which it is proposed to issue and sell at this time, bonds to the amount of $40,000,000 for new mills, improvements and work expansions. This will be the first large and, to date, most important new financing in several years, through security sales, to be applied to increased facilities for production.

Private investment is 13½ per cent greater than it was in 1934.

CONTRACTS

(Thousands of Dollars)

	Weekly Average Week Dec. 1934	Prev. 4 Weeks	Dec. 26 1935
Federal Government	$3,979	$11,393	$17,032
State and municipal	15,399	34,591	40,216
Total public	$19,378	$45,984	$57,248
Total private	5,977	7,281	7,059
Week's total	$25,355	$53,265	$64,307
Cumulative to date:			
1934..$1,360,596,000	1935..$1,590,151,000		

NEW PRODUCTIVE CAPITAL

(Thousands of Dollars)

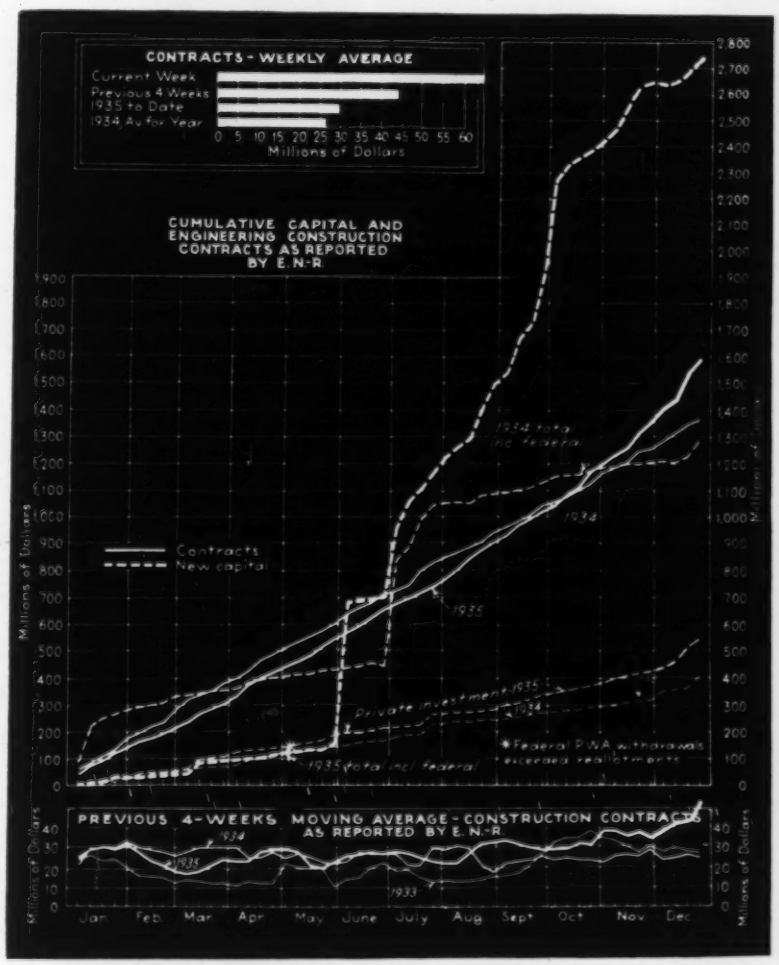
1935	Week Dec. 26	Cumulative
State and municipal	$26,045*	$497,102*
RFC loans, S&M	12,096	51,476
PWA allotments, S&M	—4,857*	756,621*
Corporate issues	1,278	38,296
PWA private	....	9,086
Local contrib. to WPA	....	31,861
Total non-federal	$34,562	$1,384,442
PWA federal	3,936	1,353,592
Total new capital	$38,498	$2,738,034
Cumulative to date:		
1934..$1,282,000,000	1935..$2,738,034,000		

*Includes transfer from federal to private investment financing by sale through RFC of PWA bonds.

Note: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for federal construction, deficiency act funds. An arbitrary percentage (25%) of the WPA allotments and local contributions to WPA work is included to allow for the capital additions through the Works Progress Administration division of the new program.

INDEX NUMBER

ENR Cost	1913 =100	1926 =100	ENR Volume	1913 =100	1926 =100
Dec., 1935	**194.90**	**93.69**	**Nov., 1935**	**171**	**75**
Nov., 1935	194.90	93.69	Oct., 1935	162	71
Dec., 1934	201.86	97.00	Nov., 1934	98	43
1934 (Av.)	198.10	95.23	1934 (Av.)	114	50
1933 (Av.)	170.18	81.80	1933 (Av.)	102	47
1932 (Av.)	156.97	75.45	1932 (Av.)	127	56


CONTRACTS - WEEKLY AVERAGE
Current Week
Previous 4 Weeks
1935 to Date
1934 Av. for Year
0 5 10 15 20 25 30 35 40 45 50 55 60
Millions of Dollars
CUMULATIVE CAPITAL AND ENGINEERING CONSTRUCTION CONTRACTS AS REPORTED BY E.N.R.
Millions of Dollars
Contracts
New capital
1934 total incl federal
1934
1935
Private investment 1935
1934
1935 total incl federal
*Federal PWA withdrawals exceeded reallotments
PREVIOUS 4-WEEKS MOVING AVERAGE - CONSTRUCTION CONTRACTS AS REPORTED BY E.N.R.
1934
1935
1933
Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec
Millions of Dollars

Construction Equipment and Materials

Roll Copper for Use In Built-up Decks

Light weight copper sheeting, in weights of one ounce and two ounces per square foot, for use in built-up roofs or other decks, is now being supplied by the American Brass Co., Waterbury, Conn. The thin copper sheets can be used in place of heavy felt layers to provide a light and watertight covering. When used on wood roof decks, the copper should be laid over

a felt base, which is to prevent the asphalt binder from running through cracks. On other types of roofs it is only necessary to prime the deck with asphalt roof primer.

Instead of being supplied in a continuous sheet, the Electro-Sheet copper, so named because of the electrolytic process of production, comes in rolls with sections 21 ft., 11 in. long cemented together to provide expansion joints. One section 30 in. wide will cover one-half a square with a 6 in. lap.

Besides its use in built-up roofs, Electro-Sheet copper can be used in a number of weatherproofing and damp-proofing applications. As a means of damp-proofing foundation walls, it can be applied, with any suitable adhesive, to the outside face of the wall. It can also be used over a concrete sub-floor, thus protecting the finished floor from moisture. Because of its long life it can be used as weatherproofing instead of sheathing paper or felt on side walls and roofs.

Cutting Device Reduces Sewage Screening Nuisance

The nuisance and unsanitary conditions attendant to the incineration or burial of sewage screenings are greatly eliminated by the comminutor made by the Chicago Pump Co., Chicago, Ill., which cuts screenings into pieces small enough to pass through a ¼ in. screen.

Comminutors are made in five sizes covering a wide range of sewage flows. They can be installed as single units or in groups and adapted to any flow. The machine consists of a main structural element of cast iron. A vertical motor with a gear reducer, designed for 37 r.p.m. for the small unit and 10 r.p.m. for the largest unit, drives a slotted cast iron drum. A comb shaped cutting plate is mounted vertically on the column and cutting teeth mounted on the circumference of the drum pass between the comb teeth with a shearing action to cut the solids.

The smaller comminutors are designed to rest on the floor of the raw sewage influent channel and the column is high enough to place the motor above the flood stage. The larger units are suspended from a truss or structural member. Sewage flows through the drum slots and out the bottom of the drum to the treatment plant. Large solids are caught between the cutting plate and teeth and are gradually cut small enough to pass through the drum slots.

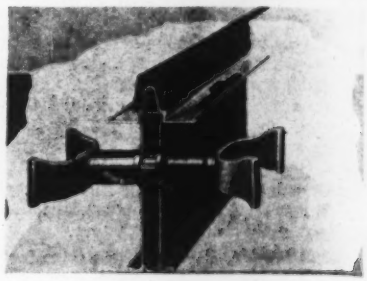
New Dowel Bar System For Highway Joints

A dowel bar system designed to give more adequate load transmission across highway expanson joints has been developed by the J-Bar Co., Chicago, Ill.

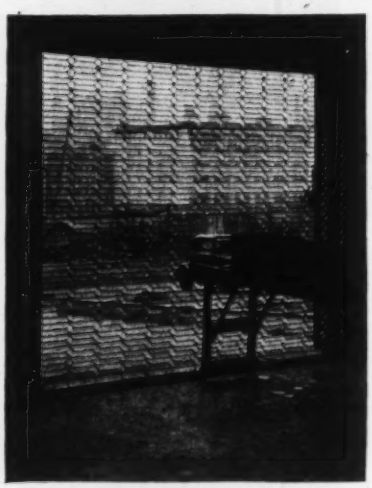
The J-Bar unit consists primarily of a short dowel bar acting between two anchored and reinforced bearing sleeves. The dowel is ¾ in. in diameter and 4⅝ in. long and slides in the two bearing sleeves which are 4 in. long and have wing anchors to give a greater bearing surface. Lugs on the sleeve give rigidity to the unit.

Only two men are needed for the installation of J-Bar units which are factory assembled in order to eliminate [illegible] job assembly. Because the J-Bar is [illegible] shorter than the reinforcing steel [illegible] bar there is less danger of its being th[illegible] out of alignment thus doing away [illegible] the necessity of rewiring. Also becau[illegible] its short length the J-Bar leaves no [illegible] areas where honeycombing can occur.

The J-Bar is applicable to all types of joints including metal air-cushion ex[illegible]



sion joints, sealed metal contraction joints, copper sealed bituminus, felt, cork, rubber or dummy joints. The unit shown in the accompanying photograph is made up of a metal stool with 16 oz. of copper seals at top and bottom, the J-Bar and a premolded bituminous cap.



LOADING PLATFORM PROTECTED BY ROLLING GRILLE

A steel grille for door and window openings in commercial and industrial buildings which, without sacrificing air and light provides against trespassing and damage, has been developed by the Kinnear Manufacturing Co., Columbus, Ohio.

The steel rolling grille is counterbalanced for easy operation. It consists of round steel bars connected by pressed steel links. It coils on a heavy spiral and travels in guides on the sides of the opening. Helical springs in the barrel provide the counterbalance. It can be operated manually or by a motor.

New Equipment in Brief

Low Alloy Steel. The Inland Steel Co., Chicago, has announced a new steel, named Hi-Steel. It is of the low-alloy, high tensile strength class. The minimum yield point is 60,000 lb. per sq.in. for gages lighter than ¼ in and 55,000 lb. in heavy gages. Minimum ultimate tensile strength is 70,000 lb. per sq.in., giving it a high elastic ratio. The elements used give this alloy a high degree of uniformity and physical characteristics, as well as workability and make it highly resistant to corrosion. It will be supplied as sheets, strip, plates, bars, and structurals.

Heavy Duty Floors. The Ven-ite Co., Inc., Philadelphia, Pa., manufactures a new heavy duty controlled floor which contains aggregates that will not crush or roll out under heavy traffic conditions. The floors have a dense, non-skid surface which prevents oils and greases from penetrating into the body of the floor.

Business Notes

AMERICAN MANGANESE STEEL CO., Chicago Heights, Ill., announces the election of William M. Black as vice president in charge of sales. Mr. Black first entered the employ of the company in 1912 and in 1934 was appointed general sales manager.

FRANK A. HATCH, president of Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y., died at his home there Oct. 15.

BABCOCK & WILCOX CO. announces the opening of a sales office in St. Louis, Mo. F. C. Brandt, formerly of the Chicago office, is in charge of the office, which will serve the eastern half of Missouri and the southern section of Illinois.

CHAIN BELT CO., Milwaukee, Wis., has announced the appointment of the O. S. Stapley Co., Phoenix, Ariz., as exclusive distributor for Rex construction equipment in the vicinity of Phoenix,

FRANK J. RIEF, purchasing agent for the Chicago district of the newly formed Carnegie-Illinois Steel Corp., has been appointed general purchasing agent for the Universal Atlas Cement Co., subsidiary of the U. S. Steel Corp.

CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

Calif., Arcadia—City soon takes bids for 12,000 ft. steel pipe watermains, and miscellaneous fittings and valves. $79,000. P.W.A. approved $35,428 grrant. Currie Eng. Co., Andersson Bldg., San Bernardino, engrs.

★ **Calif., Pittsburg**—City commissioned A. Kempke, engr., Hobart Bldg., San Francisco, to make surveys for reservoir sites for municipal water supply. Civic organizations and Chamber of Commerce subscribe $6,000 for survey. Total est. $975,000. Noted Aug. 31, C. D.—Sept. 6, E. N.-R.

★ **Calif., San Jose**—City, C. B. Goodwin, submits to San Jose Water Works Co. informal offer of $4,500,000 for purchase of all company's holdings and properties. Offer is conditioned upon the authorization of a bond issue. Improvements and extensions are contemplated if purchase is completed. Noted Oct. 17, C. D.—Oct. 24, E. N.-R.

Mich., Detroit—See "Unclassified."

Mo., Independence—Jackson Co. Water Supply Dist. 1, c/o J. Walsh, atty., 1201 Bryant Bldg., Kansas City, making plans 30 mi. 4- to 8-in. c.i. distributions mains; tank on tower, near Grandview. $306,000. P.W.A. project. C. A. Haskins & Co., 517 Finance Bldg., Kansas City, engrs.

Mo., Raytown — Jackson Co. Public Water Supply 1 voted $165,000 bonds to construct water supply system. E. M. Bayse, Courthouse, Kansas City, engr.

N. Y., Webster—City bids in January constructing water supply system. $200,000, of which $91,668 is grant by P.W.A., remainder to be raised by private bond issue. M. Smith, 16 State St., Rochester, engr.

Pa., Kane—Borough preliminary plans for establishment of municipal water supply system, Borough Eng. Dpt., Borough Hall, engrs.

BIDS ASKED

Ill., Duquoin—Jan. 10, by City, constructing waterworks. P.W.A. project. Russell & Axon, Roosevelt Bldg., St. Louis, Mo., engrs. Noted Dec. 5, C. D.—Dec. 12, E. N.-R.

†**Ky., Fort Knox**—Jan. 13, by Con. Q. M., Fort Knox, constructing filtration plant, pumping station, 16 in. c.i. force main, elevated steel tank, dam, electric lines and other structures and utilities.

N. J., Andover—Jan. 8, by Boro, constructing water supply system with all equipment. $49,997. P.W.A. project. Col. H. A. Kelly, 930 Bergen Ave., Jersey City, engr. Noted Sept. 3, C. D.—Sept. 5, E. N.-R.

N. Y., Varysburg—See "Contracts Awarded."

O., Cincinnati—Dec. 31, by City Purchasing Agent, constructing 85x100 ft., brick, concrete pumping station to house 4 new electric pumps, for Western Hills Service on Queen City Hy. $101,000. P.W.A. project. Noted Nov. 29, C. D.

Pa., Collegeville—Jan. 3, by Joint Waterworks Com., F. H. Sautter, chn., in Borough Hall, constructing complete waterworks, incl. pumps, elevated tank, pipes, valves, chlorinator and all necessary equipment and appurtenances for boroughs of Collegeville and Trappe. Costa & Petersen, Inc., Borough Hall, 5th Ave. East, engrs.

Tex., Boyd—Jan. 2, by City, c/o J. D. Walton, mayor, waterworks extension and improvements, incl. well, turbine pump, elevated tank and distribution system. $20,000. P.W.A. project. Bids Dec. 14 rejected. F. J. Von Zuben, Electric Bldg., Fort Worth, engr. Noted Dec. 5, C. D.

B. C., Vancouver—Jan. 3, by E. A. Cleveland, engr., Greater Vancouver Water Dist., Bekins Bldg., supply and installation of 14,400 ft. 66 in. and 60 in. inside diam. electrically welded steel pipe or of 63 in. inside diam. steel cylinder rein.-con. pipe or any alternative type of pipe. Separate bids for installation and for supply will be accepted, also supply of two 48 in. cast steel or cast iron gate valves. $350,000.

CONTRACTS AWARDED

Calif., Long Beach—Bd. Water Comrs., 308 Municipal Utilities Bldg., six 3½ m.g. riveted steel tanks, to Western Pipe & Steel Co., 5717 Santa Fe Ave., Los Angeles, $234,330; 123,500 cu.yd. excav., to Martin Bros. Trucking Co., 1389 Gladys Ave., $37,000. Bids Dec. 6, awarded Dec. 12. Noted Dec. 13, C. D.—Nov. 28, E. N.-R.

Colo., Denver—Bd. Water Comrs., constructing South Boulder Diversion Conduit Siphon 6, to Lock Joint Pipe Co., 1716 California St., $96,951. Bids Dec. 4. Noted Dec. 13, C. D.

Idaho, Kimberly—City, digging wells, 1st unit of waterworks system, to A. J. Schoonover, Burley, $3,000. P.W.A. H. W. Merritt, Kimberly, engr.

Mass., Amesbury—Town, Bd. Water Comrs., Town Hall, fire hydrants, to Ludlow Valve Mfg. Co., 73 Tremont St., Boston, approximately $850. P.W.A. Bids Nov. 5, awarded Dec. 13. Noted Oct. 28, C. D.—Sept. 12, E. N.-R.

Mass., North Reading—Town, Bd. Selectmen, Town Hall, furnishing, laying 15 mi. watermains, hydrants, etc., to G. Ferullo, 31 Milk St., Boston, $189,454. Est. $230,000. Bids Dec. 5, C. D.—Nov. 7, E. N.-R.

Neb., Alliance—City, constructing electric equipment and supplies, Sects. 4, 6 and 7, to Westinghouse Electric Supply Co., 13th and Capitol Sts., Omaha, $580***electrical supplies and equipment, Sects. 1, 3 and 8, to General Electric Co., 650 19th St., Denver, Colo., $15,329***wire and cable, Sect. 2, from Habirshaw Cable & Wire Co., 40 Wall St., New York, $3,127***lamps, Sect. 4, to Upright Crawford Constr. Co., Holdredge, $202***250,000 gal. tank on tower, valves, pipe and removing old stand pipe, Sects. 9 and 13, to Omaha Steel Wks., 609 South 48th St., Omaha, $21,600*** c.i. pipe and specials, Sect. 10, to Newberry's Hardware Co., Alliance, $1,418***Sect. 11, gate valves, to Interstate Mchy. & Supply Co., 1006 Douglas St., Omaha, $152***pipe line labor, Sect. 12, to National & Decker, Alliance, $1,262. Grand total $43,671. Est. $44,529. P.W.A. Bids Dec. 6. Noted Oct. 10, C. D.

Neb., Harrison—City, waterworks improvements, incl. hydrants and valves, to M. M. Liggett, Benedict, $12,255. Est. $13,000. P.W.A. Bids Dec. 6. Noted Oct. 24, C. D.—Oct. 31, E. N.-R.

Neb., Hickman — City, constructing tank, Sect. 1, to Omaha Steel Co., 609 South 48th St., Omaha, $5,800***pipe, Sects. 2, 3, 4, and 5, to National Cast Iron Pipe Co., Land Bk. Bldg., Kansas City, Mo., $9,467***wells, Sects. 6 and 7, to Lane Western Co., Land Bk. Bldg., Kansas City, Mo., $1,503***labor, Sect. 8, to Martz Constr. Co., Seward, $5,125***pumphouse, Sect. 9, to Local Lumber Yard, $665. Grand total $22,560. Noted Dec. 6, C. D.

Neb., Stella—City, hydrants and valves for waterworks system, to Iowa Valve Co., Des Moines, Ia., $1,216. Total est. $22,814. P.W.A. Bids Oct. 11. Henningson Eng. Co., Union State Bank Bldg., Omaha, engrs.

Neb., Stella—City, 1 deep well turbine pump, Sect. 7, to Layne-Western Co., B. M. A. Bldg., Kansas City, Mo., $1,039. P.W.A. Bids Oct. 11. Noted Oct. 7, C. D.

N. J., Ocean Gate—Boro, constructing watermains, to Karlson & Reed, Inc., West Barclay St., Hicksville, N. Y., $76,022. Est. $125,454. P.W.A. Noted Nov. 20, C. D.—Nov. 28, E. N.-R.

N. J., Trenton—City, 30 in. watermains in city, to Versaggi Bros., 301 East 15th St. N.W., Wildwood, $62,736***5 mi. 8 in. mains in city, to E. R. Moorehouse Co., 315 Market St., Camden, $119,338***4.6 mi. new mains in city, to W. G. Fritz Co., West Orange, $89,618*** 3.76 mi. water line to Mercerville, to F. A. Canuso Sons, Martins Rd. and Oxford Park, Phila., Pa., $98,709***pump house, for West Trenton, to Fowler-Thorne Co., 211 North Montgomery St., $1,148. Grand total $371,549. P.W.A. Noted Dec. 12, C. D.—Dec. 19, E. N.-R.

N. Y., Niagara Falls—City, constructing rein.-con. water intake pipe from Buffalo Ave. to City Pumping Station, to Dimarco & Ciccone, White Plains. Est. $137,022. P.W.A. Bids Dec. 6. Noted Dec. 10, C. D.—Nov. 28, E. N.-R.

N. Y., Oswego—City constructing water mains, meters, pump house, hydrants, etc., Contr. A, to P. Simiele, 163 Ross Park, Syracuse. Total est. $64,350. P.W.A. Noted Dec. 11, C. D.

N. Y., Varysburg—Village, digging trenches for pipe line, 32x65 ft. reservoir, 13,600 ft. 4- to 8-in. c.i. pipe, etc., by relief labor. $39,500. W.P.A. A. M. Johnston, Rochester, engr.

N. C., Catawba—Mayor and Bd. Aldermen, waterworks system, to Herman-Sipe Co., Conover, $15,958. Est. $34,545. P.W.A. Bids Oct. 29. Noted Nov. 12, C. D.

O., Cincinnati—City Purchasing Agent, furnishing pneumatic chemical conveying equipment, capacity 7 tons per hr. in new chemical building at waterworks, to Brady Conveyor Co., 20 West Jackson St., Chicago, $5,641***concrete covering for present clear well at water purification plant, also 540 tons reinforcing steel, to Folwell Eng. Co., 333 North Michigan Ave., Chicago, Ill., $196,000***furnishing 2 vertical type 3 phase, 60 cycle, 4,150 volt water wheel generators, each 219 kva. 8 power factor, 175 kw. 327 r.p.m. for installation in new chemical building to be constructed at water purification plant, to Westinghouse Electric & Mfg. Co., 207 West 3rd St., $10,040***2 turbine water wheels each about 260 hp. at 31 ft. head for installation in new chemical building at water purification plant, to James Leffel & Co., 426 East St., Springfield, $15,975*** 40 tons special castings to Dpt. Water, to Rudisill Fdry Co., Cincinnati, $3,096***49,200 ft. of c.i. pipe to Dpt. Water, to U. S. Pipe & Fdry. Co., Addyston St., $52,740***6 dry feed machines with dissolving boxes and 2 dry feed machines with lime slackers, to Omega Mchy. Co., 4010 Pennsylvania Ave., Kansas City, Mo., $18,092***sludge handling equipment, to Dorr Co., 247 Park Ave., New York City, $103,350. Grand total $404,934. P.W.A. Noted Nov. 21, C. D.

O., Cleveland—City, 12,500 ft. 12 in. c.i. watermain in East 131st St., to A. L. Connelly Co., 3714 Perkins Ave., $125,127. P.W.A. Awarded Dec. 12. G. M. Hamlin, 501 City Hall, engr. Noted Dec. 12, C. D.—Dec. 19, E. N.-R.

O., Hamilton — City, constructing rein.-con. roof on existing Wilson Hill Reservoir and new brick, concrete booster station building, to Antenen Eng. Co., East Ave. and Hanover St., $80,251. Est. $86,800. P.W.A. Noted Dec. 9, C. D.

O., Troy — City, constructing iron removal and water softening plant, to Troy Eng. Co., Troy, $66,413. Est. $67,000. P.W.A. Awarded Dec. 11. Noted Dec. 11, C. D.

Okla., Oklahoma City—City, removing and relaying 20 in. c.i. watermain in 1st St., from Harvey to Shartel Sts., to Sherman Iron Wks., 18 East Main St., $14,825. Est. $18,000. P.W.A. Awarded Dec. 11.

Okla., Oklahoma City—Settling basin, clarifier lime unloading machinery, mechanical agitator and conduit changes at municipal waterworks, to M. A. Swalek & Co., 5194 West Main St., $71,114. Est. $74,000. P.W.A. Bids Dec. 6, awarded Dec. 9. Noted Dec. 16, C. D.

Ore., Taft—Water Bd., Taft, constructing dam and intake, pipe, 200,000 gal. concrete reservoir, chlorinator, valves and fittings, in Taft and Nebscott, to B. L. Ahton, Lebanon, $39,373. Noted Dec. 2, C.D.

S. C., Greenville—Overbrook Water & Sewer Dist., watermains and sewer outfall lines, to Reed & Abee, Inc., Asheville. Est. $91,373. P.W.A. Bids Dec. 9. Noted Dec. 3, C. D.

S. D., Oacoma—Town, constructing 1 drilled well, to A. V. DePue, Pierre, $1,530; watermains, etc., to F. J. Licht, Howard, $4,183. P.W.A. Bids Dec. 9.

★ **Tenn., Bristol**—F. V. Vance, mayor, waterworks, to V. B. Higgins & Co., Kinney Bldg., Charlotte, N. C., $588,512. P.W.A. Bids Dec. 10. Noted Dec. 5, C. D.

Tenn., Somerville—Town and P.W.A. extension to old system, and filter building and from 8,000 to 10,000 ft. 2- to 8-in. new mains, reservoir, to Bush Building Co., 805 8th Ave. N., Nashville, $32,209. P.W.A. Awarded Dec. 10.

Utah, Escalante—Town, furnishing 100,000 lin.ft. 2- to 6-in. c.i. pipe, valves and hydrants, to Pacific States Cast Iron Pipe Co., Provo, $50,800***labor, to E. K. Ferguson, Spanish Fork, $35,500. Est. $87,500. P.W.A. Bids Dec. 3. Noted Oct. 29, C. D.—Oct. 31, E. N.-R.

Utah, Kannarraville—Town, furnishing 2- to 6-in. diam. valves, hydrants and fittings, to Waterworks Equipment Co., 149 West 2nd St. S., Salt Lake City, $6,686; labor, to Chamberlin & Pugh, Kanab, $5,200. Est. $15,000. P.W.A. Bids Dec. 16. Noted Nov. 1, C. D.—Nov. 7, E. N.-R.

Utah, Orderville—Town, water system, force account***22,000 lin.ft. 2- to 6-in. c.i. pipe, valves, hydrants, to Pacific States Cast Iron Pipe Co., Provo, $12,285***waterworks meters and meter boxes, to Waterworks Equipment Co., 149 West 2nd St. S., Salt Lake City, $2,422.

Section Index

Engineering Structures:

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C. D. Construction Daily.

E. N.-R. Engineering News-Record.

Federal Government projects symbol †

◆

†*Federal Government.*

For official proposal advertising see Searchlight Section

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Photo shows effects of disintegration after only a few years of exposure. All exposed concrete structures in northern climates, no matter how carefully engineered or built, are subject to disintegration.

END THIS untimely disintegration with POZZOLITH

● Costly disintegration of concrete, so apparent in most exposed construction jobs, meets a stubborn and discouraging enemy in POZZOLITH.

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POZZOLITH provides in concrete a sturdy resistance to shrinkage...to freezing and thawing...to corrosion. In an ever-increasing number of important projects POZZOLITH is assuring longer life and greater durability, with resultant savings in upkeep.

POZZOLITH increases durability of concrete in three ways:

1. Increases density 12%; improves resistance to the disruptive action of freezing and thawing 40%.*
2. Minimizes shrinkage, the prime cause of checking and cracking, which lead to untimely disintegration.
3. Greatly increases resistance to corrosion.

These qualities are proved beyond question by independent laboratory tests involving, among other severe tests, as many as 250 freezing and thawing cycles.

Write for full information.

26,000 yards of Pozzolith concrete used in the Cleveland Underground Exhibition Hall, erected in 1932. Sam W. Emerson Co., Contractors.

* *Report of Research by Loring O. Hanson, Registered Professional Engineer. University of Wisconsin, Madison, Wisconsin.*

THE MASTER BUILDERS COMPANY

Cleveland, Ohio

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Waterworks (Continued)

Est. $25,500. **P.W.A.** Bids Nov. 19. Noted Nov. 8, C. D.

Wash., Enumclaw—City, replacing worn out mains with c.i. pipe, incl. 11,700 ft. 8- to 12-in. c.i. pipe, valves and fittings, to Herber & Sheidon, 1919 South L St., Tacoma, $23,700. Est. $20,000. Bids Dec. 10. Noted Nov. 13, C. D.—Nov. 21, E. N.-R.

Wash., Port Townsend—City, installing 81,060 ft. 4- to 12-in. wood pipe, backfilling, supplying all valves and other fittings for construction of Olympic gravity water supply system, to J. H. Coyne, Port Townsend, $54,089. Est. $59,921. T. W. Campbell, City Hall, engr.

Wash., Port Townsend—Town, general overhauling water system, incl. supply line on Sheridan Ave., 19th St., Hastings Ave., Discovery Rd., incl. 43,947 ft. 6- to 12-in. wire wrapped wood pipe, to J. H. Coyne, Port Townsend, $54,098. Est. $62,000. Bids Dec. 9, awarded Dec. 10. Noted Dec. 3, C. D.

Wash., Ridgefield — Town, replacing watermains, to Parker-Schram, Portland, Ore., $22,400. Est. $26,000. **P.W.A.** Bids Dec. 10. Noted Nov. 29, C. D.—Dec. 5, E. N.-R.

Wash., Tacoma — City, replacing 2,021 ft. 46 in. wood stave pipe with same length 52 in. rein.-con. or steel pipe and replacing 4,042 ft. 54 in. wood stave with 58 in. concrete or steel pipe, to American Concrete & Steel Pipe Co., 459 East 15th St., concrete, $107,715; to Arcorace & Colueeio, Seattle, steel, $92,071. **P.W.A.** Bids Dec. 6. Noted Dec. 18, C. D.—Dec. 26, E. N.-R.

W. Va., Fairmont—City, improving water supply system, incl. new wash water tanks, filter beds, chlorinator, etc., to Cement Gun Co., Allentown, Pa., $49,538. Noted Dec. 2, C. D.—Dec. 5, E. N.-R.

W. Va., Mason—Town, at office of F. E. Bletner, mayor, and L. O. Tucker, recdr., new water system, incl. reservoir, tanks, to Weaver-Crane Trucking Co., Charleston, $31,000. **P.W.A.** Noted Nov. 15, C. D.

W. Va., Paden City—Town, T. H. Jeffers, mayor, additions to waterworks system, repairs and additions to plant, deep well, 50 hp. Diesel motor turbine pump and 100,000 gal. storage tank, to Sistersville Constr. & Supply Co., Sistersville, $25,382. **P.W.A.** Noted Dec. 2, C. D.—Dec. 5, E. N.-R.

B. C., Kaslo—City fabrication and supply of approximately 9,000 ft. wire wound, double burlapped wood stave pipe for new Kemp Creek water supply system, to Pacific Coast Pipe Co., Ltd., 1551 Granville St., Vancouver. Noted Nov. 22, C. D.—Nov. 28, E. N.-R.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Calif., Huntington Beach—City soon takes bids sewage disposal plant, $86,500. P.W.A. provided $36,891 to assist in financing. Currie Eng. Co., Andreson Bldg. San Bernardino, engrs.

Kan., Greensburg—City plans sewer and sewage disposal plant, $125,000. P.W.A. grant approved. Paulette & Wilson, engrs. Noted Sept. 6, C. D.—Sept. 12, E. N.-R.

Kan., Topeka—City, making plans laterals, trunk line, pumping station and force main, Collins to Gage Blvd., and 18th to 21st Sts. Est. about $85,000.

N. Y., Oneida—City, J. F. Mahar, mayor, plans trunk line sewer in Old Erie Canal, incl. 42 in. iron pipe and tile and concrete pipe, $36,000. Applied for W.P.A. Loan.

N. Y., Syracuse—City plans storm sewers in Burnett Ave. $225,357; in Niagara St. $26,703; and repairing 40 main sewers and disposal plants. $40,972. Total $293,032.

Wash., Ellensburg—City plans sewage disposal plant. Est. $160,000. $91,500 P.W.A. funds available if city can match. State Dpt. Health, Olympia, engr.

★ **Wash., Spokane** — City plans 237,000 ft. sewer, $958,874. P.W.A. approved. A. D. Butler, City Hall, engr.

Wis., Menomonee — City rejected bids Dec. 5, constructing sewage treatment plant, $29,000. P.W.A. project. Greeley & Hansen, Chicago, Ill., engrs.

B. C., Victoria—Municipality plans constructing incinerator. $60,000.

BIDS ASKED

Ill., Duquoin—Jan. 10, by City, constructing sewers. P.W.A. project. Greeley & Hansen, 6 North Michigan Ave., Chicago, engrs. Noted Nov. 15, C. D.—Nov. 21, E. N.-R.

Ky., Louisville—Jan. 14, by Comrs. of Sewerage, 400 Marion E. Taylor Bldg., J. H. Durham, chn., Larchmont Ave. Sewer, E.R.A. Project 19, Contr. 90, involving 1,692 lin.ft. 45 in. rein.-con. circular sewer. W. M. Caye, technical engr.; adv. E. N.-R. Dec. 26.

Mich., Detroit—Jan. 3, by L. G. Lenhardt, comr. P. Wks., Sect. 9 of sewage disposal plant, consisting of 4,634 ft. 15 ft. 6 in. cylinder in Jefferson Ave. from Traver to Scotten Aves. P.W.A. project. J. S. Stringham, city engr.

N. Y., Ithaca—Jan. 7, by Dpt. Health, State Office Bldg., Albany, sewers and water lines at New Biggs Memorial Hospital.

†*Federal Government.*

N. Y., Yonkers—Jan. 2, by Bd. Contr. & Supply, City Hall, trenching for sewers in Park Ave. from High St. to Ashburton Ave. P.W.A. project. C. Sheridan, city engr.

Tex., San Antonio—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Sacramento—H. G. Denton, city clk., constructing storm sewers in L St. between 9th and 18th Sts., to A. and B. Constr. Co., and Gogo & Rados, 10024 South Figueroa St., Los Angeles, joint bid $41,900***storm sewers in 13th and G Sts., to Lord & Bishop, Native Sons Bldg., $54,900***storm sewers in W and X Sts. between 18th and 27th Sts., to J. W. Terrell, 2765 Donner Way. $20,401. Grand total $117,201. **P.W.A.** Bids Nov. 21, awarded Dec. 3. Noted Dec. 4, C. D.

Calif., Stockton—City Council, constructing trunk line sewer system, incl. 9,260 lin.ft. 8- to 24-in. vitr. clay sewers, to W. J. Tobin, 3701 Balfour Ave., Oakland, $42,448. Est. $53,000. **P.W.A.** Bids Dec. 2, awarded Dec. 7. Noted Sept. 11, C. D.—Sept. 19, E. N.-R.

Conn., Watertown — J. L. Scott, chn. Fire Dist., 34,000 ft. sanitary sewers, to Clark Sewer Constr. Co., 631 Lidley St., Bridgeport; disposal plant addition, to C. W. Blakeslee & Sons, Inc., 58 Waverly St., New Haven. $220,000. P.W.A. project. Bids Nov. 29. H. W. Buck, 650 Main St., Hartford, engr.

Ia., Nashua—City constructing sewage mains and disposal plant, to A. Mathis, Valley Junction, $36,000. Est. $38,000. **P.W.A.** Bids Dec. 7. Noted Sept. 30, C. D.—Oct. 3, E. N.-R.

Mass., Medford—Commonwealth of Massachusetts, Metropolitan Dist. Comm., Sewer Div., F. D. Smith, ch. engr., W. E. Whittaker, secy., 20 Somerset St., Boston, constructing Sect. 107 of North Metropolitan Sewer, to J. F. Fitzgerald Constr. Co., 214 Essex St., Boston, $169,883. **P.W.A.** Bids Dec. 5, awarded Dec. 12. Noted Dec. 17, C. D.

★ **Mich., Detroit**—Dpt. P. Wks., constructing Sect. 7, Detroit River Intercepter Sewer to be constructed in tunnel, 15 ft. circular sewer of concrete construction in West Jefferson Ave. from Brush to 5th Sts., to S. A. Healy Co., 6561 East Seven Mile Rd., $726,916. **P.W.A.** Bids Dec. 3. Noted Dec. 11, C. D.

Minn., St. Paul—City, H. W. Austin, city purch. agt., constructing Phalen Creek Sewer Outfall extension, to Thornton Bros. Co., 1343 Dayton Ave., $47,500. **P.W.A.** Bids Dec. 3.

Minn., Sauk Rapids—Village, furnishing materials and constructing pipe line connecting with proposed sewage disposal plant in St. Cloud, incl. 80,000 lin.ft. 18 in. vitr. clay tile, to Central Lumber Co., Sauk Rapids. Est. $60,000. **P.W.A.**

Neb., Blue Hill—City, constructing sewerage system, to Young & Hall, Mayward. $24,500. **P.W.A.** Bids Dec. 10. Noted Sept. 25, C. D.—Oct. 3, E. N.-R.

Neb., Dorchester—City, constructing sewerage system, to Dobson & Humphreys, 824 1st Natl. Bank Bldg., Lincoln, $23,600. **P.W.A.** Bids Dec. 9. Noted Sept. 25, C. D.—Oct. 3, E. N.-R.

N. J., Linden—City, constructing trunk sewer, to Louis & Francesco, Central Ave., Westfield, $149,440. Est. $267,275. **P.W.A.** Noted Nov. 20, C. D.—Nov. 28, E. N.-R.

N. J., Metuchen—Boro, constructing sewage disposal plant, to Midland Constr. & Contg. Co., 47 Central Ave., Hackensack, $95,337. Est. $95,454. **P.W.A.** Noted Dec. 4, C. D.—Dec. 12, E. N.-R.

N. Y., Auburn—W. E. Bonley Co., general contractors, Flint Blk., Auburn, approximately 117 tons reinforcing steel for sewage disposal plant, to Concrete Steel Co., 207 James St., Syracuse. **P.W.A.** Noted Dec. 12, C. D.—Dec. 19, E. N.-R., under "Contracts Awarded."

N. Y., Buffalo—Buffalo Sewer Authority, City Hall, Dec. 14, constructing Dodge and Riley St. Sewers, to Fahning Constr. Co., Buffalo, $25,011 and $16,244 respectively***in Glenwood Ave., to LaMachia & Guadaguino, Hamburg, $16,900. **P.W.A.** Bids Dec. 14. Noted Dec. 5, C. D.

★ **N. Y., Elmira** — City constructing sewers, Contr. 1, to F. A. Canuso & Son, 704 South 12th St., Phila., Pa., $439,327. Bids Nov. 18. **P.W.A.** Noted Dec. 4, C. D.—Dec. 21, E. N.-R.

N. Y., Maybrook—Bd. Educ., sewage disposal plant, to Frederick J. Wright Co., 42 Schroon Ave., Hawthorne. Est. $62,700. **P.W.A.** Bids Dec. 2. Noted Dec. 10, C. D.—Nov. 21, E. N.-R.

N. Y., Yonkers—City, constructing house and storm sewers in Trenchard St. and Kettel Ave., to A. and J. Cianciulli, Inc., 1001 Sawmill River Rd., $25,335. **P.W.A.** Noted Dec. 2, C. D.

O., Chillicothe—City, constructing 1st section sanitary sewer to proposed new sewage disposal plant, to Brewer and Brewer Sons, Inc., Chillicothe. $184,914. Est. $200,000. **P.W.A.** Noted Dec. 13, C. D.—Dec. 19, E. N.-R.

Okla., Oklahoma City — City, constructing South Side Sewage Disposal Plant, to Koller Constr. Co., Tradesmen's Bldg., Oklahoma City, $45,653. Est. $48,000. **P.W.A.** Bids Dec. 6. Noted Dec. 16, C. D.

Ore., Ashland—City, sewage disposal plant, to Dunn & Baker, Klamath Falls, $76,832.

Ore., Hillsboro—City, sanitary sewerage system, to Kerr & Kibbie, 425 Salmon St., Port-

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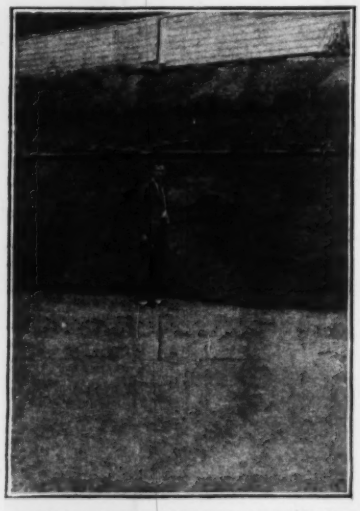

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Sewerage, etc. (Continued)

land, $96,097. **P.W.A.** Bids Dec. 5. Noted Dec. 3, C. D.

S. C., Greenville—See "Waterworks."

Tex., San Antonio—City, C. K. Quin, mayor, and Bexar Co., F. Woodhull, judge, sanitary sewer lateral extensions and improvements, relief labor. Pipe will be purchased and workers drawn from relief rolls. Est. $98,664. W.P.A. plus $3,998 city funds. W. S. Goodman, co. engr.

Wash., Seattle — City, laying East Montlake Intercepting Sewer, to Thomas Scalzo, 1829 Lane St. $25,239. Est. $30,000. **P.W.A.** Noted Dec. 16, C. D.—Dec. 19, E. N.-R.

Wash., Seattle—City, constructing 9,062 ft. 42 in. rein.-con. sewer from south city limits along East Marginal way to point 1,000 ft. south of Purcell St. in Henderson St., Units 2 and 8, also two 3,050 g.p.m. horizontal centrifugal sewage pumps, incl. two 25 hp. squirrel cage motors, to Northwest Constr. Co., 3950 Sixth Ave. N.W., $123,522 est. $117,758; Units 3, 4, 6, 7, Henderson Trunk Sewer, Henderson pumping plant, to Arcorace & Colussio, 8423 48th St. S., $226,317 est. $252,598. Noted Dec. 5, C. D.

Wis., Kaukauna—City, constructing intercepting sewers, Div. C and D, to Gray-Robinson Co., Manitowoc, $113,971. **P.W.A.** Bids Nov. 20. Noted Dec. 10, C. D.

Wis., Shorewood Hills — Village, sewers to M. M. Christensen, St. Paul, Minn., $107,626. Noted Dec. 17, C. D.

Wis., Stoughton—City, constructing iron removal plant and sewage disposal plant, to E. F. Scheflow, Elgin, Ill., $65,000***sewage pumps to Fairbanks-Morse Co., 900 South Wabash Ave., Chicago, Ill., $1,416***clarifiers, to Link Belt Co., 2404 West Clybourn St., Milwaukee, $3,020***distributor to American Well Works Co., 20 North Wacker Dr., Chicago, Ill., $1,399***floating cover and digestor, to Pacific Flush Tank Co., 4241 North Ravenswood Ave., Chicago, Ill., $4,056 and $4,852 respectively*** filter equipment, to Roberts Filter Co., Darby, Pa., $1,154. Grand total $80,897. **P.W.A.** Bids Dec. 7, W. G. Kirchoffer, Madison, engr.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

California—L. H. Gibson, dist. engr., State Hy. Comn., 50 Higuera St., San Luis Obispo, rejected bids Nov. 19, salvaging existing 120 ft. bridge from Pecheco Creek and erecting at San Benito River and salvaging existing 100 ft. San Benito River Bridge. Noted Nov. 27, C. D.

New Hampshire—State Hy. Dpt., Concord, plans grade crossing overpass over railroad, Durham, Strafford Co., $45,000; railroad overpass, Plaistow, Rockingham Co., $40,000; railroad overpass, East Concord, Merrimack Co., $86,000; railroad overpass D.W. Hy., Concord, Merrimack Co., $35,000; railroad overpass, Rockingham Junction, Newfields, Rockingham Co., $125,000; railroad overpass over railroad, Fitzwilliams, Cheshire Co., $40,000; railroad overpass, Carroll, Coos Co., $50,000; railroad overpass Haverhill, Grafton Co., $75,000; railroad overpass, Gorham, Coos Co., $50,000. J. W. Childs, Concord, engr.

N. J., Belmar — Monmouth Co., Freehold, plans extensive alterations to Shark River Bridge between Avon and Belmar. Est. $316,364. $142,364 P.W.A. grant, $174,000 to be raised by county. J. F. Hogan, Freehold, engr.

N. Y., Belleville—Dpt. P. Wks., Albany, soon takes bids steel, concrete bridge. $45,000. T. F. Farrell, state hy. engr.

N. Y., Binghamton—City, City Hall, bids in spring, constructing railroad underpass between Oak and Front Sts. for Ferry Street Bridge. P.W.A. project. Public Service Comn. will hold hearing early in January. A. B. Cohen, 1 Madison Ave., New York, engr. Noted Dec. 4, C. D.—Dec. 12, E. N.-R., under "Contracts Awarded."

Tex., New Braunfels—Comal Co., c/o W. Schweigmann, New Braunfels, plans 140 ft., rein.-con., steel underpass across South Setuin St. $120,000. $60,000 federal approval.

Washington—State Hy. Dpt., Olympia tentatively appropriates $200,000, King Co. provides $3,000 to be used by State Hy. Dpt. in surveying and preparing plans, Black River Junction. $200,000. L. V. Murrow, State Hy. Dpt., Olympia, engr.

Wash., Tacoma—City, cancelled bids to have been opened Oct. 16, for toll bridge over Hylebos Waterway. Noted Sept. 12, C. D.—Sept. 19, E. N.-R.

Ont., Port Arthur—Provincial Dpt. Northern Development, Toronto, soon takes bids constructing bridge over Nipigon River. $150,000. E. Smith, 239 Amelia St., Fort William, engr.

★ **N. B., St. John**—Election in April, $1,000,000 for constructing bridge across harbor.

BIDS ASKED

★ **N. Y., Binghamton**—Dec. 31, by Dpt. P. Wks., State Bldg., Albany, and Erie R. R. Co., Cleveland, O., constructing Glenwood Ave. Grade Crossing Elimination project. $687,915. F. W. Donovan, 71 Frederick St., Binghamton, engr. S. Burton Cohen, 1 Madison Ave., New York, consult. engr.

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N. Y., Binghamton—Jan. 8 (extended) by Dpt. Mental Hygiene, State Office, Albany, repairing trestle at Binghamton Hospital. T. F. Farrell, state hy. engr. Noted Dec. 10, C. D.

N. Y., Fort Wadsworth—Jan. 10, by Comn., 270 Madison Ave., New York, constructing bridge carrying tracks of Staten Railway Co. across St. Johns Ave. and re... structures. P.W.A. project.

CONTRACTS AWARDED

★ **Ill., Chicago**—Chicago Park Bd., Bu... Park, constructing foundation for sou... proach to Outer Drive Bridge, to Great ... Dredge & Dock Co., 104 South Michigan ... $938,505. Noted Jan. 31, C. D.—Feb. 7, E. ...R

Ind., Evansville—Vanderburgh Co., cons... ing substructure for steel, concrete bridge ... Pigeon Creek, to Pioneer Constr. Co., M... Vernon Rd., Evansville, and A. G. Ryan, ... ney, $137,000; superstructure, to Internat... Steel Co., Edgar St., $104,806. Est. $180... **P.W.A.** Bids Dec. 14. Noted Dec. 5, C. ... Nov. 21, E. N.-R.

Kentucky—State Hy. Comn., Frankfort, ... structing 2 main river piers, for bridge ... Kentucky River at Shelby St., FA226-B1-B, ... Dravo Contg. Co., Neville Island, Pittsbu... Pa., $61,606***constructing approaches, ... 226-B2-B, to Geo. M. Eady Co., 340 Byrne ... Louisville, $37,099***superstructure for ... 350 ft. steel arch and steel girder spans, ... 226-B3-B, to Wisconsin Bridge & Iron Co., 5... North 35th St., Milwaukee, Wis., $127,805, ... in Franklin Co. Grand total $226,510. B... Dec. 6. Noted Nov. 29, C. D.

Mich., Saginaw—City, rein.-con., steel gra... separation, depressing street under railro... tracks, Eastern City limits of Saginaw ... P. M. tracks, to Jutton-Kelly Co., 640 N... Center Bldg., Detroit, $221,322. **W.P.A.**

Mo., Independence — City, rein.-con. viadu... over Missouri Pacific R. R. tracks at Cry... and Lexington Sts., to L. W. Weeks Const... Co., Kansas City. Est. $18,814. **P.W.A.** Bla... & Veatch, 4706 Bway., Kansas City, engrs.

N. Y., New York—Frederick Snare Corp., general contractors, 114 Liberty St., 4,60... tons structural steel for eliminating grad... crossing at West 79th St. over New York Cen... tral R.R. tracks at Riverside Dr., for Trans... Comn., 270 Madison Ave., to American Bridg... Co., Frick Bldg., Pittsburgh, Pa. Noted Dec. 3, C. D.—Dec. 5, E. N.-R.

Maine—State Hy. Comn., L. D. Barrows, ch. engr., Augusta, Island Ledge Rd. Bridge over Webhanet River, P.W.A. 1014-33, Wells, to Ellis C. Snodgrass, Augusta, $15,404***superstructure Tide Mill Bridge over Crane Mill Brook, Edmunds, to Lackawanna Steel Constr. Corp., Box 951, Buffalo, N. Y., $10,070*** Jones Bridge over East Branch Union River, Mariaville and Waltham, to Walter V. Mitton, Inc., 12 Winter St., Augusta, $12,590. Grand total $38,064. Bids Dec. 4, awarded Dec. 13. State Hy. Comn., L. D. Barrows, ch. engr., Augusta, will readvertise for bids on substructure on bridge Edmunds; and Cross Cove Bridge, Jonesport

★ **New York**—Triborough Bridge Authority, 111 8th Ave., New York, constructing bulkhead walls along East River Drive from East 92nd to East 119th Sts., Manhattan Connection Triborough Bridge connecting Manhattan, Bronx and Queens Boros, to A. M. Hazell, Inc., 117 Liberty St., New York, $1,542,000. **P.W.A.** Bids Dec. 5. Noted Dec. 9, C. D.—Dec. 12, E. N.-R.

O., Cincinnati—City, constructing 5 span 314 ft. steel concrete bridge on McMillan St., to Kerpen Constr. Co., 1030 Summer St., $166,652 est. $152,000***2 span 108 ft. steel, concrete bridge on Columbia Ave., to O'Connell & Sweeney, Kellogg and Tennyson Sts., $33,969 est. $27,520. **P.W.A.** Noted Dec. 3, C. D.—Dec. 5, E. N.-R.

Pennsylvania—See "Streets and Roads."

†**Pa., Phila.**—U. S. Eng., Philadelphia, reconditioning 3 highway bridges over Chesapeake & Delaware Canal, to Wisconsin Bridge & Iron Co., 5023 North 35th St., Milwaukee, Wis., $174,324. Noted Oct. 29, C. D.—Oct. 31, E. N.-R.

Wash., Tacoma—City, constructing 242 ft. open-spandrel rein.-con. arch span bridge with five 46 ft. approaches, East 34th St. and Pacific Ave., to MacRae Bros., 614 Fifth Ave., Seattle, $109,455. Est. $123,000. Noted Nov. 27, C. D.

Ont., Holland Landing—Dpt. Hys., Toronto, concrete, steel bridge over Holland River, to Ontario Constr. Co. Ltd., Bank of Toronto Bldg., St. Catherines, $45,000.

STREETS AND ROADS

BIDS ASKED

Ill., Galesburg—Jan. 8, by Knox Co., A. R. Smith, supt. Hys., paving. $76,363. P.W.A. project.

New Jersey—Dec. 30, at office State Hy. Dpt., Trenton, constructing 1.019 mi. Route 33, Sect. 3C from Hurley's Corner to Shark River Station Rd., Monmouth Co., incl. 16,274 cu.yd. roadway unclassified excav., removing 7,370 sq.yd. rein.-con. pavement, 18,500 lb.

†*Federal Government.*

Streets and Roads (Continued)

reinforcing steel in bridge; grading, paving 2.125 mi. Route 25, Sects. 2A, 3A, Crystal Lake to Bordentown, Burlington Co., incl. 62,000 cu.yd. unclassified excav., 32,992 sq.yd. 10 in. plain concrete pavement, 4.512 bituminous concrete surface Type FA-BC-1; paving 2.88 mi. Route 24, Sect. 22A, Hightstown By-Pass, Mercer Co., 5,000 cu.yd. unclassified roadway and 2,000 cu.yd. borrow excav., 43,193 sq.yd. 10 in. rein.-con. and 3,054 sq.yd. 9 in. plain concrete pavement, 433 sq.yd. 18 in. rein.-con. bridge approach slab; constructing 4.42 mi. Route 25, Sect. 26, Robbinsville to Hightstown, Mercer Co., 69,000 cu.yd. unclassified roadway, 90,000 borrow and 7,000 wet excav., 43,190 lb. reinforcing steel in bridges, 224 sq.yd. 18 in. rein.-con. bridge approach slab; constructing 4.42 mi. Route 25, Sect. 26, Robbinsville to Hightstown, Mercer Co., 69,000 cu.yd. unclassified roadway, 90,000 cu.yd. borrow and 7,000 cu.yd. wet excav., 224 sq.yd. rein.-con. bridge approach slab, 43,190 lb. reinforcing steel in bridges. Noted Nov. 27, C. D.

New Jersey—Jan. 6, by E. D. Sterner, comr. State Hy. Comn., Trenton, constructing 3.349 mi. Route 34, Sect. 5 from Route 35 to New Bedford Rd., Monmouth Co., incl. 163,921 cu. yd. unclassified roadway and 3,780 cu.yd. wet excav., removing 1,400 sq.yd. rein.-con. pavement, 534 sq.yd. 18 in. rein.-con. bridge approach slab.

New Jersey—Jan. 6, by E. D. Sterner, comr. State Hy. Comn., Trenton, constructing 5.911 mi. Route 24, Sect. 24 from Burlington to Crystal Lake, Burlington Co., incl. 102,859 cu. yd. unclassified roadway, 16,161 cu.yd. borrow and 2,490 cu.yd. wet excav., 151,946 sq.yd. 9 in. rein.-con. and 2,180 sq.yd. 9 in. plain concrete pavement, 56,650 lb. reinforcing steel in bridges.

O., Cleveland—City bids after Feb. 1, stone, cement sidewalk in Northerly, Southerly, Westerly and West Park Sidewalk Districts, $80,000. R. Hoffmann, city engr.

CONTRACTS AWARDED

California—State Hy. Comn., Sacramento, grading, creek run gravel and treated liquid asphalt surfacing 1.75 mi. hy. at the Oaks and at Clow Creek, Mendocino Co., to N. M. Ball Sons Co., P. O. Box 404, Berkeley, $38,488; grading 1.6 mi. hy. between Junction with Route 41 and 1½ west, Fresno, to Stewart & Nuss and J. Jurkovich, 410 Thorne Ave., Fresno, $30,244. Bids Nov. 27, awarded Dec. 11. Noted Dec. 9, C. D.

California—State Hy. Comn., Sacramento, grading, crusher run base and road mix surfacing 6.6 mi. hy. between 1 mi. east of Cholame and Kern Co. Line, San Luis Obispo Co., to A. Teichert & Son, P. O. Box 1113, Sacramento, $177,051*** grading, road mix surfacing 5.1 mi. hy. between 4 mi. south of Shafter and Shafter, Kern Co., to Southern California Roads Co., 2145 East 25th St., Los Angeles, $67,510*** grading, road mix over gravel base surfacing 5.4 mi. hy. between point 1 mi. east of Santa Ynez and Los Olivos, Santa Barbara Co., to Oswald Bros., 366 East 58th St., Los Angeles, $94,080. Grand total $365,211. Bids Dec. 4, awarded Dec. 13. Noted Dec. 13, C. D.—Nov. 28, E. N.-R.

California—State Hy. Comn., State Bldg., place plant-mixed surfacing 5.4 mi. hy. between 1.4 mi. south of Thermal and junction with Route 26, Riverside Co., to R. E. Hazard & Sons, P. O. Box 1438, San Diego Co., $28,456*** grading, applying road mix surface treatment 2.4 mi. hy. between Casitas Pass and East Casitas Pass, Ventura Co., to Daley Corp., 4430 Boundary Ave., San Diego, $97,030*** grading, imported selected material and bituminous macadam armor coat applied surfacing 2.9 mi. hy. Bolza Ave. between Bay Blvd. and Bolsa Chica Rd., Orange Co., to Sully-Miller Contr. Co., 1500 West 7th St., Long Beach, $44,651. Grand total $170,137. Bids Nov. 29, awarded Dec. 13. Noted Dec. 9, C. D.—Nov. 21, E. N.-R.

Illinois—Dpt. P. Wks. & Buildings, Div. Highways, Springfield, constructing 0.9098 mi. 40 ft. brick or Warrenite bituminous or bituminous concrete highway in Danville, to R. McCalman, Danville, $44,881.

Ia., Algona—City, paving, curbing, guttering State St., to Amodeo Paving Co., 1420 Woodland Ave., Des Moines, $30,654. Est. $33,000. P.W.A. Bids Dec. 6.

Ia., Valley Junction—City, completing paving Railroad St., to Amodeo Paving Co., 1420 Woodland Ave., Des Moines, $30,753. Est. $39,000. P.W.A.

Kentucky—State Hy Comn., Frankfort, grading, draining, concrete paving 6.002 mi. Lexington-Winchester Rd., FA 17-AGS, Clark Co., to Carey-Reed Co., Lexington, $190,802. Bids Nov. 22. Noted Nov. 7 and 13, C. D.

★ **Kentucky**—State Hy. Comn., Frankfort, to Ky.-Va. Stone Co., Middlesboro, concrete paving 0.497 mi. Main St. in Paris, N.R.M. 296-BS, Bourbon Co., 30,446; grading, draining 2.997 mi. Bond-East Bernstadt Rd., WPSO 414-BG, Jackson Co., $38,654; 2.437 mi. Gray's Campbell School Rd., WPSO 417-AG, Knox Co., $28,403***to Langhorne & Langhorne Co., Huntington, W. Va., 2.764 mi. Concord-Vanceburg Rd., WPSO 421-AG, Lewis Co., $30,673*** to J. S. Boone, Owensboro, 3.766 mi. Glasgow-Flippin Rd., N.R.S. 331 BG, Barren Co., $54,329***to Codell Constr. Co., Winchester, 1.785 mi. Jackson-Buckhorn Rd., WPSO 389 AG, Breathitt Co., $40,475; to Codel Constr. Co., 1.56 mi. Patten-Adele Rd., WPSO 430-AG, Mazoffin Co., about $30,000***to Ralph E. Mills Co., Frankfort, 2.724 mi. Vanceburg-Mt. Carmel Rd., FR 101-AG, Lewis Co., $20,286; 1.841 mi. Crestwood-Brownsboro Rd., WPSO 440-AG, Oldham Co., $25,173; 2.23 mi. Fullerton-Oliver Hill Rd., WPSO 292-BG, Greenup Co., $28,812***to T. M. Strider & Co., Cotton State Bldg., Nashville, Tenn., 2.708 mi. Elizabethtown-Louisville Rd., FA 203-CG, Hardin Co., $152,113***to Frazer & Cocke, Wickliffe, 1.451 mi. Clinton-New Cypress Rd., WPSO 412-AG, Hickman Co., $6,916***to Blair & Franse Constr. Co., Lexington, 4.2 mi. Tompkinsville-Martinsburg Rd., WPSO 493-AG, Monroe Co., $44,359; 0.527 mi. Clay City-Mt. Sterling Rd., WPSO 436-AG, Powell Co., $11,995***to R. M. Robinson, Owensboro, 1.647 mi. Cerulean-Dawson Springs Rd., WPSO 494-AG, Trigg Co., $12,562***to Corum Bros., Madisonville, grading, draining, bituminous surfacing 1.573 mi. Greenville-Central City Rd., WPMH-WPGM 40-AGS, Muhlenburg Co., $32,706*** to R. Myers, Cambellsburg, Ind., grading, surfacing approaches for bridge and I-beam span bridge over Licking River, Cynthiana, 0.142 mi. hy., SP 893-AB, Harrison Co., $54,555***to N. E. Stone & Co., Madisonville, concrete paving 0.456 mi. Main St., Madisonville, WPMH 41-FS, Hopkins Co., $31,157***to Carey-Reed Co., Lexington, concrete paving 0.473 mi. North 2nd St., Richmond, WPMH 167-B-GS, Madison Co., $26,188***to H. H. Miller Constr. Co., Jackson, bit. surface Type 2, napped sandstone and waterbound macadam base paving 0.487 mi. Jefferson and Highland Aves., Jackson, WPMS 484-AS, Breathitt Co., $18,875. Grand total $718,677. Bids Dec. 6. Noted Nov. 19 and 29, C. D.—Nov. 21, E. N.-R.

Kentucky—State Hy. Comn., Frankfort, rock asphalt, surface mix binder, waterbound macadam base paving 0.667 mi. Main St., Hopkinsville, FA 150-CS and FA 171-CS, Christian Co., to E. L. Traughber, Elkton, $24,897. Bids Sept. 20. Noted Sept. 30, C. D. — Oct. 3, E. N.-R.

Maine—State Hy. Comn., Augusta, grading and base 1.01 mi. Project 26, Westbrook, to W. H. Hinman, Inc., North Anson, $27,788***concrete surfacing 1.59 mi. Project 34, Oxford, to Bridge Constr. Corp., Augusta, $73,426***gravel surfacing 0.45 mi. Project 142-A, Winslow, to J. R. Cianchette & Co., Pittsfield, $16,278***1.07 mi. Project 358, Biddeford, to Jos. P. McCabe, Inc., 509 East 1st St., South Boston, Mass., $31,480. Grand total $148,972. P.W.A. Bids Dec. 4, awarded Dec. 13. Noted Dec. 17, C. D.

Minnesota—State Hy. Dpt., St. Paul, grading 0.7 mi. State Project 23-210-221A, B and C, W.P.G.M. 556-A, W.P.G.S. 556-B and W.P.M.S. 556-C, at New London, incl. 161,940 cu.yd. excav., to Megarry Bros., Bain, $32,072. Bids Nov. 29. Noted Nov. 21, C. D.

Minn., St. Paul—City, paving Exchange and Forbes Sts., to Okes Constr. Co., 1501 1st Natl. Bank Bldg., $56,988. P.W.A. Bids Dec. 3. Noted Dec. 2, C. D.

Mo., Slater—Slater Special Road Dist., constructing system rural highways, to Nervent McDowell, Black Water, $160,511. Est. $181,509. Bids Oct. 8. Noted Sept. 30, C. D.—Oct. 3, E. N.-R.

Neb., Lincoln—City, City Hall, to Abel Constr. Co., 900 North 16th St., paving 42nd St., $3,202; S St., $3,691; 19th St., $2,401; K St., $10,252; 26th St., $5,508; 19th St., $5,585; W St. $4,748; 32nd St., $2,330*** to Cochran Constr. Co., 821 1st Natl. Bank Bldg., Woodsdale Blvd., $2,341; 8th St., $8,540; Arlington St., $2,051; Park St., $2,345; Sumner St., $3,433***to Reimers Kauffman, 1111 North 16th St., Alley between A and Washington Sts., $1,500; alley between D and E, 15th and 16th Sts., $1,500. Grand total $57,315. Est. $59,721.

New Hampshire—State Hy. Dpt., Concord, 4 in. on 5 in. gravel surfacing 3.465 mi. Daniel Webster Hy., Thornton and Woodstock, Grafton Co., and crushed gravel on gravel surfacing 2.722 mi. Daniel Webster Hy., Bethlehem Grafton Co., to John Iafolla Constr. Co., Dedham, Mass., $88,054 and $68,481 respectively, est. $125,000 and $82,000 respectively. Bids Dec. 5. Noted Dec. 13, C. D.

N. J., Salem—Salem Co., paving Haines Rd., Mannington Twp., to J. W. Powell, Inc., Salem, $34,868. Awarded Dec. 12.

N. Y., Otisville—Village, 7,200 lin.ft. concrete curbing and 3,600 lin.ft. sidewalks, to H. H. Smith, Inc., 6 Linden Pl., Middletown. Est. $25,000. P.W.A.

†**North Carolina**—Pub. Rds., Dpt. Agriculture, Shenandoah Life Insurance Bldg., Roanoke, Va., constructing 13.21 mi. Great Smoky Mountain Natl. Parkway, Allegheny, Wilkes and Ashe Counties, to Nello L. Teer & Nello L. Teer, Inc., Durham, $290,055. Noted Dec. 13, C. D.—Dec. 19, E. N.-R.

Ore., Portland—State Hy. Comn., grading 2.07 mi. Agency Sect., Warm Springs Hy., Jefferson Co., to M. L. O'Neil & Son, Eugene, $41,799.

Pennsylvania—R. A. Tebbs, for W. Van Dyke, secy. Hys., Harrisburg, concrete paving 0.21 mi. hy. and relaid brick on reconstructed base paving and reconstructing bridge on 0.21 mi. Route 641, Sect. 10, Harmony Twp., Beavery Co., to C. V. Beatty, East Liverpool, O., $93,610; bituminous on native or modified stone

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†*Federal Government.*

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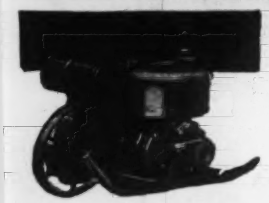

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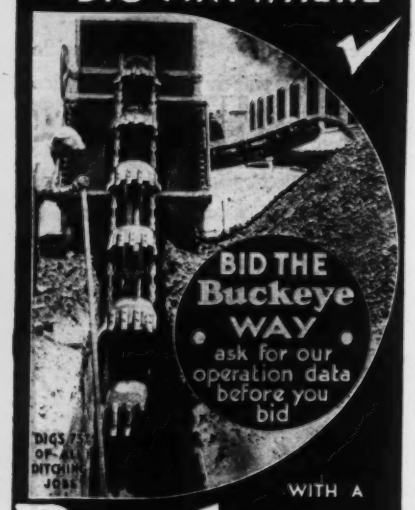

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Streets and Roads (Continued)

paving, rein.-con. bridge, grading, drainage 1.25 mi. Route 356, Sect. 5, Londonderry Twp., Bedford Co., to L. M. Hutchinson, Orbisonia, $36,580. Bids Nov. 1. Noted Nov. 7, C. D.—Oct. 24, E. N.-R.

Pennsylvania—P. M. Tebbs, for W. W. Van Dyke, secy. Hys., Harrisburg, dual type paving consisting two 10 ft. rein.-con. outside lanes and one 10 ft. center lane of bit. surface on crushed stone base, 5 rein.-con. structures and rein.-con. flares, 5.11 mi. Route 10, Sect. 3, New Milford and Great Bend Twps., Susquehanna Co., to D. L. Risser, 713 Chestnut St., Lebanon, $353,095; dual type paving, etc., 1.06 mi. Route 108, Sect. 9, South Strabane Twp., Washington, Washington Co., to Tri-State Eng. Co., Waynesburg, $109,264. Bids Nov. 8. Noted Nov. 13, C. D.—Nov. 21, E. N.-R.

Pennsylvania—R. A. Tebbs, for W. W. Van Dyke, secy. Hys., Harrisburg, rein.-con. paving, 3 rein.-con. structures, bituminous on native stone surfacing 2.66 mi. Route 361, Sect. 1, Lake and Lehman Twps., Luzerne Co., to Tyler & Cole, Meshoppen, $135,206. Bids Oct. 18. Noted Oct. 22, C. D.—Oct. 10, E. N.-R.

Utah — State Hy. Comn., Salt Lake City, grading 2.938 mi. Utah Co., to Strong & Grant, Springville, $31,080 est, $40,318; 10.341 mi. road in Juab Co., to J. M. Sumsion, Springville, $25,547 est, $27,466. Bids Dec. 9. Noted Dec. 5, C. D.

Vermont—State Hy. Dpt., H. E. Sargent, ch. engr., Montpelier, grading base and drainage 0.2 mi. Route 12-B, F.A. 166-B, Albany, to R. R. Prarie, Albury, $4,840***I-beam overpass and approaches on 0.1 mi. U. S. Route 2, over St. Johnsbury and Lake Champlain R. R., St. Johnsbury, to O. W. Miller Co., Inc., 181 Fountain St., Springfield, Mass., $26,301*** I-beam bridge on State Aid Hy. 2, Panton, to C. I. Hosmer, Greenfield, $15,932. Grand total $47,073. Bids Nov. 22, awarded Dec. 3. Noted Dec. 9, C. D.

Vermont—State Hy. Dpt., H. E. Sargent, ch. engr., Montpelier, gravel mixed in place surface course with refined tar surfacing 0.5 mi. Route 3, F.A.P. 206-A, Pittsford, to Earle & Merry, Rutland, $10,350; gravel surface course paving 1.5 mi. Route 30-A, F.A.P. 146-C, Benson, to C. R. Beach, Fairhaven, $24,425. P.W.A. Bids Dec. 6, awarded Dec. 13. Will readvertise for bids improving 0.8 mi. hy. Panton, and 0.3 mi. hy. Salisbury. Noted Dec. 17, C. D.

Wash., Tacoma—City, clearing, grubbing, grading asphaltic concrete paving 7,998 sq.yd. Puyallup-Graham Rd., Secondary Rd. Project 46, incl. 4,103 ft. Type 4 guard rail, to Joseph Warter, Sr., 631 North Fife Ave., $26,405. Est. $30,165. Noted Dec. 16, C. D.—Dec. 19, E. N.-R.

EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

★ **Calif., Los Angeles**—Harbor Dpt., City Hall, A. Eldridge, genl. mgr. because of failure of bond issue of $7,000,000 on Nov. 27, the Harbor Department is investigating ways and means by which the department may obtain federal aid in financing portion of projected improvements, incl. Harbor Belt Line R.R., $270,627; Marine Passenger Terminal, Berth 155, $256,441; removal of existing sheds at Berth 155, $60,916; dredging outer harbor and East Basin, $231,404; constructing banana discharging terminal at Berth 147, West Basin, $196,245. Total est. $1,015,643. E. C. Earle, harbor engr.

Mont., Livingston—State Water Conservation Bd., R. R. Purcell, secy., State Capitol, Helena, rejected bids Dec. 5 cleaning, repairing and constructing headworks on Livingston Ditch, Park Co. $30,000. Will readvertise. J. S. James, State Capitol, Helena, state engr.

O., Put in Bay—Town, making plans dredging harbor. $10,000-$40,000. Officials conferring with State Dpt. P. Wks. in regard to completion. W. Gould, 40 Birkhead Pl., Toledo, engr.

BIDS ASKED

†**Florida**—Jan. 10, by U. S. Eng., Jacksonville, dredging 264,550 cu.yd. from Jacksonville to Miami Intracoastal Waterway, Port Orange Relocation cut.

†**Md., Annapolis**—Jan. 29, by Yards & Docks, Navy Dpt., Wash., D. C., constructing shore protection, Spec. 7947.

†**Mont., Missoula**—Jan. 3, by Bureau Reclamation, Missoula, constructing diversion works and structures, Main Canal, Frenchtown project, near here.

†**Nev., Elko**—Jan. 4, by U. S. Indian Irrigation Service, 751 South Figueroa St., Los Angeles, Calif., constructing arch dam containing 3,500 cu.yd. concrete, about 70 mi. north of here on Wild Horse site, Owyhee River.

New Jersey—Dec. 30, by Bd. Commerce & Navigation, State House, Trenton, construction steel sheet pile jetty in Delaware Bay at mouth of Bidwells Creek, Middle Twp., Cape May Co., V. Gelineau, ch. engr.

O., Cleveland—City bids about Jan. 15, dredging Cuyahoga River. R. Hoffmann, city engr.

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LOW BIDDERS

★ **Tex., Eagle Pass** — Maverick Co. Water Control & Imprv. Dist. 1, c/o [illegible] Schmidt, secy., Eagle Pass, Dec. 14, constructing main and lateral canals and appurtenant structures, from Hardwick Constr. Co., Frederick Bldg., Memphis, Tenn., $1,474,676. Est. $2,422,000. P.W.A. project. Noted Dec. 6, C. D.—Dec. 4, E. N.-R.

CONTRACTS AWARDED

†**Arizona**—Bureau Reclamation, construct[illegible] spillway for Stewart Mountain Dam, Salt River Project, to Allied Bridge & Constr. Co., and Central Bridge & Constr. Co., 703 Union Bank Bldg., Omaha, Neb., $150,724. Est. $1[illegible],734. Bids Nov. 25. Noted Dec. 2, C. D.—Nov. 21, E. N.-R.

★ †**Arizona and California**—Bureau Reclamation, Dpt. Interior, Federal Bldg., Yuma, constructing 5 mi. All American Canal, in California, to George Pollock Co., P. O. Box [illegible], Sacramento, Calif., $700,988. Bids Nov. [illegible]. Noted Dec. 3, C. D.—Nov. 7, E. N.-R.

★ †**Ariz., Yuma**—Bureau Reclamation, Dpt. Interior, Federal Bldg., constructing Imperial Dam and desilting works on Colorado River, to Morrison-Knudsen Co., Boise, Idaho; Utah Constr. Co., Ogden, Utah, and to Winston Bros. Constr. Co., 1470 Northwest Bank Bldg., Minneapolis, Minn., $4,374,241. Bids Nov. 21. Noted Nov. 27, C. D.—Dec. 5, E. N.-R.

†**Ill., Cairo**—U. S. Eng., Memphis, Tenn., installing corrugated iron metal culvert pipe, excavating outlet drainage ditch and constructing concrete manhole together with appurtenant work and accessories in Cairo Drainage Dist., to Haas Bros. Constr. Co., Belleville, $1,883. Bids Nov. 18. Noted Nov. 14, C. D.

La., New Orleans—Bd. State Engineers, New Orleans, constructing Wilton Canal in East Carroll Parish, Willow Point Diversion Canal in East Carroll Parish, 50,000 cu.yd., drainage canal Sect. 2, 210,000 cu.yd., Sect. 3, 350,000 cu.yd., Sect. 4, 100,000 cu.yd., to C. W. Greeson, Baton Rouge, at 77c. per cu.yd. Bids Dec. 9. Low bidder reported Dec. 16, C. D., incorrect. Noted Dec. 16, C. D.—Nov. 28, E. N.-R.

★ **Montana**—Montana State Water Conservation Bd., State Capitol Bldg., Helena, rock and earth filled dam and appurtenant structures on east fork of Rock Creek in Granite Co., to Inland Constr. Co., 3867 Leavenworth St., Omaha, Neb., $231,945***40 mi. canals and appurtenant structures, to Clifton & Applegate, Anaconda, $211,390***3 weirs and rock and earth fill dam on north fork of Smith River and enlarging, repairing and building appurtenant structures, to J. L. McLaughlin, Great Falls, $203,147 and $97,056 respectively***irrigation canal and storage dam, on Swamp Creek, Saunders Co., to M. J. Kinney Co., Spokane, Wash., $51,158. Grand total $794,606. P.W.A. Bids Nov. 29. Noted Dec. 10, C. D.

New Hampshire—State Hy. Dpt., Concord, constructing 900 lin.ft. stone masonry seawall, to Guerini Bros., 22 Regis Rd., Mattapan (Boston), $24,910. Bids Dec. 5, awarded Dec. 11. Noted Dec. 13, C. D.

†**N. H., Newport**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing retaining wall at U. S. Post Office, to A. Durso Co., 78 Washington Ave., Haverhill, $2,421. Bids Nov. 20, awarded Dec. 13. Noted Nov. 13, C. D.—Nov. 21, E. N.-R.

†**New York**—U. S. Eng., Army Bldg., 39 Whitehall St., New York, dredging 800 cu.yd. material other than ledge rock and 4,000 cu.yd. ledge rock in East Chester Creek, to Bay State Dredging & Contg. Co., 62 Condor St., Boston, Mass., $85,800. Noted Oct. 30, C. D.—Nov. 7, E. N.-R.

†**Utah, Ogden**—Bureau Reclamation, Denver, Colo., constructing surge tank and diversion works at Ogden Canyon Conduit, to Ora Bundy, Ogden, $11,477. Bids Nov. 7, awarded Dec. 7.

†**Va., Norfolk**—Yds. & Docks, Navy Dpt., Wash., D. C., dredging in Norfolk Harbor, to Norfolk Dredging Co., Norfolk, $100,000.

Wis., Lake Geneva — E. L. Maytag, Lake Geneva, 40,835 cu.yd. excav., haul, level and pumping, 100 ft. 21 in. corrugated pipe; 358 ft. open ditch, 3 lines 21 in. concrete pipe, to MacDonald Dredging Co., Elkhorn. Bids Nov. 9. Noted Nov. 7, C. D.

★ †**Wyoming** — Bureau Reclamation, Casper, constructing Tunnels 3, 4, 5 and 6 on Casper Canal, Casper Alvoca Project, to W. E. Callahan Constr. Co., and Gunther & Shirley, 207 South Spring St., Los Angeles, Calif., $794,948. Bids Nov. 25. Noted Dec. 2, C. D.—Nov. 7, E. N.-R.

★ †**Wyo., Casper**—Bureau Reclamation, Casper, constructing Seminoe Dam and Power Plan for Casper-Alcova Project, to firm composed of Morrison-Knudsen Co., Inc., Boise, Idaho; Utah Constr. Co., Ogden, Utah, and Winston Bros. Co., 1470 Northwest Bank Bldg., Minneapolis, $2,759,805. Bids Nov. 26. Noted Oct. 31, C. D.—Nov. 7, E. N.-R.

B. C., Fraser River—Secretary Dpt. P. Wks., Ottawa, Ont., constructing North Arm Jetty, to Coast Quarries Ltd., Vancouver, $22,119. Est. $31,000. Noted Oct. 16, C. D.—Oct. 24, E. N.-R.

B. C., Steveston—Dpt. P. Wks., Ottawa, Ont., repairing Woodwards training wall on Fraser River, near here, to Gilley Bros., Ltd., 902

†*Federal Government.*

Earthwork, etc. (Continued)

Columbia St., New Westminster, $16,665. Noted Nov. 8, C. D.—Nov. 14, E. N.-R., under Fraser River.

Ont., Hudson—Canadian Natl. R. R., rip-rapping right-of-way along LacSeul, to Rayner Constr. Co., Ltd., Toronto, $75,000.

UNCLASSIFIED

PROPOSED WORK

Calif., Susanville—LIGHT DISTRIBUTION—City, Council defeated $75,000 bonds to finance construction of electric generating transmission and distribution system. Total est. $120,000. Application filed with P.W.A. for grant, 45% of cost. Noted Oct. 24, C. D.—Oct. 31, E. N.-R.

Ind., Evansville — UNLOADING WHARF — City, Bd. P. Wks., G. H. Bosse, ch., City Hall, soon takes bids constructing unloading wharf for river boats, widening Riverside Dr., paving river bank slope, boat harbor, sewer from Waterworks Rd. to Ohio River. $497,400. L. Geupel, city engr.

Louisiana—OIL and GAS DEVELOPMENT—Arkansas-Louisiana Gas Co., c/o Cities Service Co., 66 Wall St., New York, plans oil and gas properties development, Lincoln Parish, incl. drilling. To exceed $50,000.

Louisiana—OIL and GAS DEVELOPMENT—Shell Petroleum Corp., Shreveport, plans developing oil and gas properties, Rodessa Oil Fields, Caddo Parish. To exceed $50,000.

Mass., Worcester — FIELD HOUSE — City, School Dpt., City Hall, field house and stadium. $65,000. Project rejected by P.W.A. J. E. Gallagher, 25 Brattle St., archt. Noted July 11, C. D.—July 18, E. N.-R.

Minn., Winona—PARK IMPROVEMENTS—City, E. E. Chadwick, city engr., plans by Boyum, Schubert & Sorenson, Winona, plans improvements in Lake Winona, incl. dredging both ends, building bathhouses, playgrounds, beach, drives, etc. $228,000. $75,000 bond issue planned. Will apply for W.P.A. funds.

N. J., Newark — PARK — Essex Co. Park Comn., 115 Clifton Ave., plans constructing 1.8 mi. road, curbing and paving, complete drainage system, paths, lawns and parking places. $389,876. W.P.A. project.

N. Y., Flushing—COMFORT STATION—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans by A. Embury, c/o owner, constructing 1 story, brick comfort station, 155th St. and Boune Park. $40,000.

N. Y., Mount Pleasant—STABLES—J. A. Hartford, Grasslands Rd., plans constructing stables, riding track and estate buildings, Grasslands Rd. $100,000. **Maturity indefinite.** Architect not appointed.

N. Y., New York—FREIGHT LOADING PLATFORMS, etc.—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad Street Sta., Phila., Pa., plans by H. G. Atwater c/o owner, constructing 1 story, 13x133 ft. freight loading platforms and freight house. $28,000 with equipment.

N. Y., New York—RECREATION BUILDING, etc.—Dpt. Parks, Arsenal Bldg., Central Park, plans by A. Embury, c/o owner, 1 story, 35x85 ft. recreation building and comfort station, near Madison Ave. and 120th St. $45,000.

N. Y., Niagara Falls—BROADCASTING STATION—Niagara Falls Broadcasting Corp. plans commercial radio broadcasting station to operate 1,420 kilocycles with 100 watt power at night and 250 watt in daytime. To exceed $17,750. Applied for license to Federal Communications Commission.

N. Y., Olean—AIRPORT—City plans constructing municipal airport, incl. hangars, administration building, flood lighting system, runways, etc. $150,000. G. Miles, city engr. **Maturity 1936.**

O., Cleveland — ARENA — Cleveland Hockey, Inc., A. Suthpin, pres., 1720 East 22nd St., plans by T. Conner, Builders Exch. Bldg., 1 story, brick, steel sports arena building, Euclid Ave. $150,000. Noted Apr. 10, C. D.—Apr. 18, E. N.-R.

Okla., Oklahoma City—GAS LINE—Phillips Petrol. Co., Bartlesville, made preliminary plans 16,000 lin.ft. 10 in. high pressure gas line on Eastern Ave. $40,000. A. H. Riney, Bartlesville, engr.

Okla., Oklahoma City—OIL PIPE LINE—Phillips Petroleum Co., Bartlesville, preliminary plans 16,000 lin.ft. 6 in. oil pipe line on Kate St. $40,000. A. H. Riney, Bartesville, engr.

Okla., Oklahoma City—PIPE LINE—Phillips Petroleum Co., Bartlesville, made preliminary plans 20,000 lin.ft. 6 in. oil pipe line on Lottie St. $30,000. A. H. Riney, Bartlesville, engr.

Pa., Duquesne—GAS PIPE LINE—Carnegie Natural Gas Co., Carnegie Bldg., Pittsburgh, plans 8 in. gas pipe line across Monongahela River. To exceed $25,000.

Pa., Kearsarge—AIRPORT—Erie City, N. Aitkin, city engr., and Erie Co., W. Supplee, co. engr., plans improvements to Port of Erie Airport, here, incl. three 250 ft. wide runways, 4,000 ft. long and other improvements. $50,000 or more. **Maturity in 1936.**

R. I., Cranston—STADIUM—City, P. Wks. Dpt., plans stadium and recreational center, $60,000. P.W.A. grant $27,000. F. P. Shelton & Sons, 1038 Hospital Trust Bldg., Providence, archts. Noted Feb. 21, C. D.—Feb. 28, E. N.-R.

Tex., Cuero—SWIMMING POOL, etc.—City, J. T. Newman, mayor, P.W.A. allotment rescinded for gymnasium and athletic field, track, ball diamond, etc. $42,000. Noted Oct. 9, C. D.—Oct. 17, E. N.-R.

†Washington—RESETTLEMENT PROJECT—U. S. Resettlement Administration, W. A. Duffy, regional dir., Portland, Ore., plans constructing buildings, other improvements to establish 75 families in 25 acre farms on Snohomish Co., 1800 acre resettlement project. $241,360 allotted. B. Beach, Everett, project mgr.

Wash., Seattle—GOLF COURSE—City plans constructing West Seattle Golf Course, $328,434. Comptroller General approves W.P.A. funds. Architect selected soon.

Alta., Edmonton — POWER DEVELOPMENT—Northern Canada Development & Holdings Ltd., J. E. Sydie, secy., Northern Investment Bldg., plans constructing 2,500 hp. power development at Old Man River, Sask., and constructing 16 mi. transmission line. W. G. Stuart, engr. Noted Oct. 30, C. D.—Nov. 7, E. N.-R.

BIDS ASKED

†Fla., Miami — AIR STATION — Jan. 6, by Treas. Dpt. at office Sup. Archt., constructing U. S. Coast Guard Air Station. Noted Nov. 19, C. D.—Nov. 21, E. N.-R.

†Fla., Pensacola—HANGARS, etc.—Jan. 15 (extended date) by Yards & Docks, Navy Dpt., Wash., D. C., constructing hangars, storehouses, shops, test stands, etc., Spec. 8082; and quarters at Naval Air Station, Spec. 8083. Noted Dec. 12, C. D.—Dec. 19, E. N.-R.

†T. H., Pearl Harbor—FUEL OIL PLANT—Jan. 15, by Yards & Docks, Navy Dpt., Wash., D. C., improving fuel oil plant.

LOW BIDDERS

★ **New York**—TUNNEL—Port of New York Authority, 111 8th Ave., New York, Dec. 19, plaza and open cut, Contr. MHT 5B, for New Jersey approach to Midtown Tunnel, from G. M. Brewster & Son, 11 West 42nd St., New York, $2,654,053***cast iron or structural, for Contr. MHT 5A, from Underpinning & Foundation Co., 155 East 44th St., New York, $1,103,505 or $1,052,405 respectively. Noted Nov. 27, C. D.—Dec. 5, E. N.-R.

CONTRACTS AWARDED

Calif., Madera—GYMNASIUM—Madera Union High School Dist., 1 story, rein.-con. gymnasium, to Midstate Constr. Co., 902 Power Bldg., Fresno, $49,676. **P.W.A.** Awarded Dec. 3.

Calif., San Francisco — RECONSTRUCTING RAILROAD TRACKS—Public Utilities Comn., City Hall, reconstructing railroad tracks of Municipal Railway in Union St., for City and San Francisco Co., to Eaton & Smith, 715 Ocean Ave., $41,150. **P.W.A.** Bids Dec. 2, awarded Dec. 11. Noted Dec. 12, C. D.

Georgia and Alabama—RAILWAY—Purchasing Agent Central of Georgia Ry., Macon, Ga., purchasing 4,500 tons of 90 pound steel rail, to Tennessee Coal Iron & Railroad Co., Bona Allen Bldg., Birmingham, Ala.; owner will replace rail at various locations, day labor.

Ill., Chicago—RAILWAY—See "Materials and Equipment", under "Bids Asked."

★ **Mass., Boston**—PIER PLATFORMS—Commonwealth of Massachusetts, Dpt. P. Wks., W. F. Callahan, comr., reconstructing pile, timber, concrete platforms at Commonwealth Pier 5, South Boston, to Merritt, Chapman & Scott Corp., 292 Pequot Ave., New London, Conn., $717,974. Bids Dec. 9, awarded Dec. 13. Noted Dec. 17, C. D.—Dec. 5, E. N.-R.

Mass., Charlestown—DOCKS—Boston & Maine R. R., North Station, Me., dock fill and rip rap at Pier 42, to T. Stuart & Son, Watertown. Est. $50,000.

N. J., Hoboken—STEEL RAILS—Delaware Lackawanna & Western R. R., Hoboken Terminal, 1,000 steel rails, to Bethlehem Steel Co., East 3rd St., Bethlehem, Pa.; 9,000 tons, to Carnegie Illinois Steel Co., Carnegie Bldg., Pittsburgh, Pa. Est. $355,000. Owner will lay same by day labor.

New York — LIGHTING EQUIPMENT — Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, lighting equipment for Independent Railroad System on Line D-Elmhurst Ave. to 178th St. Station (inclusive) and Jamaica Yard, Queens Boro, Contr. L-80, to Lord Electric Co., 105 West 40th St., New York, $429,500. Bids Nov. 12. Noted Nov. 14, C. D.

N. Y., New York—ELEVATED EXTENSION—Dpt. Plant & Structures, Municipal Bldg., removing elevated extension over Park Row and Centre St., Manhattan Terminal of Brooklyn Bridge, to Lincoln Wrecking Co., 44 Court St., Brooklyn, $7,282. Bids Nov. 20.

N. Y., New York—SUBWAY—Rosoff-Brader Constr. Co., general contractors, 295 Madison Ave., 250 tons reinforcing steel for Sixth Avenue Subway from 40th to 47th Sts., to Truscon Steel Co., Youngstown, O., for Bd. Transportation, J. H. Delaney, chn., 250 Hudson St. Noted Oct. 31, C. D.—Nov. 5, E. N.-R

†*Federal Government.*

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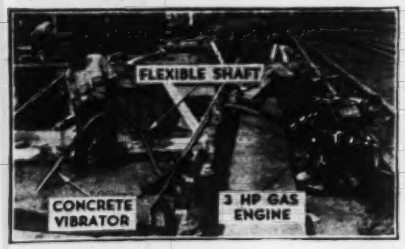

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Unclassified (Continued)

Tex., Port Arthur—ATHLETIC FIELD—Bd. Educ., c/o L. B. Abbey, pres., Port Arthur, constructing athletic field, incl. 1 story, 88x164 ft. administration building, etc., to W. L. James c/o J. H. Baxter, Port Arthur, $81,000 ***plumbing, to Port Arthur Plumbing Co., Port Arthur, $4,725***heating and ventilating, to Warren Co., Inc., 614 Walker St., Houston, $14,800***electrical work, to Copeland Electric Co., M and M Bldg., Houston, $4,080. Grand total $104,605. **P.W.A.** Bids Nov. 29, C. D.

Va., Lexington—SWIMMING POOL—Virginia Military Institute, constructing swimming pool, to W. W. Coffey Co., Lexington, $34,037.

Wash., Seattle — MAUSOLEUM — Acacia Memorial Park, 15,000 Victory Way, 1 story, basement, concrete mausoleum addition for 350 crypts, on Victory Way, to Dally Constr. & Eng. Co., Llond Bldg., $30,000; bronze niches, to Oregon Brass Co., Southeast 10th St. and Salmon Ave., Portland, Ore. $7,000. Est. $80,000. Awarded about Nov. 30. Noted Nov. 20, C. D. —Nov. 28, E. N.-R.

MATERIALS AND EQUIPMENT

PROPOSED WORK

TRUCKS—**Bridgeport, Conn.**—City, P. Brewster, dir. P. Wks., plans purchasing new special trucks for municipal ash and rubbish collecting system.

LAMP STANDARDS—**Buffalo, N. Y.**—City, City Hall, ordered G. J. Summers, comr. Public Works, to purchase and install 104 lamp standards between Jefferson and Bailey Aves. on Clinton St.

TANKS—**Buffalo, N. Y.**—F. R. Taylor, 535 South Park Ave., plans installing 500 gal. steel tanks and electric pump at gasoline service station. To exceed $1,000.

PUMP—**Eastchester, N. Y.**—R. J. Bellew, 3rd trustee School Dist. 1, plans purchasing water pump for new Greenvale School, Maple St. To exceed $1,000.

GASOLINE TANK—**Williamsville, N. Y.**—H. W. Bronkie, 5742 Main St., will purchase gasoline tank for gasoline service station, 5732 Main St. To exceed $1,000. Sun Oil Co., 1608 Walnut St., Phila., Pa., lessee.

†LUMBER, etc.—**San Antonio, Tex.**—Procurement Division, Works Progress Administration, J. Armstrong, procurement officer, soon takes bids 250,000 B. M. lumber; 4,000 dynamite caps; 5,000 lb. dynamite; 10,000 bbl. cement; 3,000 bags hydrated lime; 3,000 ft. fiber board; coolers and drinking foundations for various locations.

HEAVY DUTY UNITS—**Ottawa, Ont.**—F. C. Askwith, comr. P. Wks., plans purchasing 2 extra heavy duty units fully equipped for snow plowing, cutting ridges, etc. $28,000.

FIRE FIGHTING EQUIPMENT — **Trafalgar, Ont.**—E. J. James, twp. clk., interested in prices of fire fighting equipment. $8,500 available.

BIDS ASKED

†TRACTOR MOWER, etc. — **Wash., D. C.** — Jan. 3, by General Purchasing Officer, Panama Canal, Wash., D. C., tractor mower, steel racks, galvanized wire cloth, copper wire, magnet wire, conduit elbows, lumber and timbers.

STEEL RAILS—**Chicago, Ill.**—M. J. Collins, purch. agt. Atchison, Topeka & Sante Fe R.R. Co., G. W. Harris, ch. engr., 80 East Jackson St., taking bids 58,000 tons (about 333 mi.) steel rails. Will be laid by day labor and separate contracts.

ROLLERS, etc.—**Ames, Ia.**—Jan. 6, by State Hy. Comn., Ames, 3 rubber tired or sheeps-foot rollers, 4 bituminous material mixers, 5 steel rollers, and 2,400 jack bits. F. R. White, ch. engr.

†HOISTING SHEAVES—**Duluth, Minn.**—Jan. 14, by U. S. Eng., Canal Park, Duluth, furnishing, delivering f.o.b. U. S. Eng., Sault Ste. Marie, Mich., two 60 in. pitch diameter cast steel hoisting sheaves.

†CRANE CONTACT RAIL GUARDS, etc.—**St. Paul, Minn.**—Jan. 7, by U. S. Eng., 615 Commerce Bldg., furnishing crane contact rail guards and screen systems at Lock and Dam 4, Alma, Wis., and Lock and Dam 5, Whitman, Minn., on Mississippi River.

†TRACTOR—**Vicksburg, Miss.** — Jan. 6, by U. S. Eng., Box 667, furnishing 75 hp. crawler type tractor.

ORFORD CEDAR—**New York, N. Y.**—Lester Mendell & Co., 220 West 42nd St., wishes to contract with manufacturer of orford cedar for producing venitian blinds, slats and rails for manufacture of blinds.

†SWITCHING EQUIPMENT — **Knoxville, Tenn.**—Jan. 8, by Tennessee Valley Authority, Old Post Office Bldg., Knoxville, 2,300 volt switching equipment for Wheeler Power Plant. C. H. Garity, Knoxville, dir. purchases.

†PUMPS—**Grafton, W. Va.**—Jan. 11, by U. S. Eng., Pittsburgh, Pa., 2 vertical single acting motor driven pumps and auxiliary equipment for Tygart Dam. To exceed $1,000.

VALVES, etc.—**Milwaukee, Wis.**—Jan. 9, by Central Bd. Purchases, furnishing 7 check valves, 6 butterfly valves, 3 gate valves and 6 suction pieces, and one 54 in. blind flange for water filtration plant. P.W.A. project. F. Stoelting, comr.

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PUMPS—**Winnipeg, Man.**—Jan. 6, by Chairman Greater Winnipeg Sanitary Dist., City Hall, supply of pumps for sewage disposal plant. W. R. Brereton, City Hall, engr.

CONTRACTS AWARDED

STEEL PIPE—**Long Beach, Calif.**—City R. M. Dorton, mgr., City Hall, 67,000 ft. Grade "A" plain end seamless steel pipe, random lengths, 18 to 22 ft., 269 tons total weight, Spec. C-559, for use by City Gas Dpt. to Oil Well Supply Co., 934 North Alameda St., Los Angeles, $22,019 plus $547 sales tax. Bids Nov. 21.

ELECTRIC CLOCK PARTS—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Broadway, furnishing electric clock parts for 60 cycle synchronous clocks, Spec. 1784, to Listenwalter & Gough, 827 E. 1st St., $8,035 (partial award) and to E. W. Reynolds, 315 West 5th St., $7,622. Bids Oct. 11. Noted Sept. 26, C.D.—Oct. 3, E.N.-R.

HAULING SERVICES—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., furnishing hauling services for 2 years, hauling bulk or sacked cement in Zones A, B and C, from Crestmore, Colton, Victorville and Monolith, estimated at 204,000 bbl., Spec. 1778, to Monolith Portland Cement Co., 215 West 7th St. base bid of 64c. per bbl., total about $130,560.

SHOVEL POINTS—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., shovel points as required during period of 1 year from date of contract, Spec. 1840, to H. and L. Co., 2062 Laura Ave., Huntington Park, $5,000. Bids Nov. 29, awarded Dec. 10. Noted Nov. 26, C. D.

TRANSFORMER FREQUENCY CHARGER MATERIALS—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., furnishing transformer frequency changer materials, Spec. 1832, to Allis-Chalmers Mfg. Co., 458 South Spring St., $3,454. Bids Dec. 9, awarded Dec. 14. Noted Dec. 17, C.D.

WATTHOUR METERS, etc.—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., 1,700 each 60 cycle 115/120 V. 3 wire, single phase watthour meters, and 262 each 50/60 cycle, 3 wire, 3 phase watthour meters, Spec. 1837, to Sangamo Electric Co., 417 South Hill St., $27,263. Bids Dec. 9, awarded Oec. 12. Noted Nov. 27, C.D.

CAST IRON PIPE—**South Pasadena, Calif.**—City Council, to U. S. Pipe & Fdry. Co., 417 South Hill St., Los Angeles, 246 lin.ft. 12 in. c.i. pipe at $1.88; 2,160 lin.ft. 8 in., $1.09; 300 lin.ft. 6 in., 73c.; 100 lin.ft. 4 in., 48c. Bids Nov. 27. F. Clough, City Hall, engr.

†AGGREGATES — **Ashton, Idaho** — Bureau Reclamation, Ashton, awarded contract furnishing aggregates for reservoir dam at Upper Snake River Reservoir Project, to M. J. Kuney Co., Spokane, Wash., $18,550. Bids Oct. 10.

BITUMINOUS CONCRETE—**Boston, Mass.**—City, Supply Dpt., D. F. Doherty, supt., City Hall Annex, furnishing Type "E" bituminous concrete in various sections of city, Sect. 1, South Boston, Roxbury and City Proper, to Sealdrok Co. of Mass., 228 Southampton St., Boston, $21,280***Sect. 2, Charlestown, and Sect. 4, Brighton, to M. F. Gaddis, 6 Beacon St., $12,150 and $13,300 respectively***Sect. 3, West Roxbury and Hyde Park, to S. J. Tomasello Corp., 15 Bay St., Dorchester, $23,625. Grand total $70,355. Bids Nov. 12, awarded Dec. 12. Noted Nov. 19, C. D.

CAST IRON WATER PIPE, etc. — **Boston, Mass.**—City, Supply Dpt., D. F. Doherty, supt., City Hall Annex, furnishing B and S c.i. water pipe and special castings, to Warren Fdry. & Pipe Corp., 75 Federal St., $88,793. Bids Dec. 4, awarded Dec. 13. Noted Dec. 17, E. N.-R.

TRAFFIC SIGNAL EQUIPMENT — **Boston, Mass.**—City, Supply Dpt., W. W. Loomis, supt., 801 City Hall Annex, furnishing traffic signal equipment, to Signal Service Corp., 57 Monument Ave., Charlestown, Boston, $4,187; furnishing relay panels and parts, to Graybar Electric Co., Inc., 287 Columbus Ave., $2,481. Bids Oct. 24, awarded Dec. 12. Noted Oct. 18, C. D.

STEEL—**New York**—Standard & Purchase, C. B. Smith, supt., State Capitol Bldg., Albany, sheet steel to meet 1937 requirements for New York State Bureau of Motor Vehicles for license plates, to Albany Steel & Iron Co., Inc., Troy Rd., Albany, $112,000.

INSTRUMENT TRANSFORMERS — **Seattle, Wash.**—City, instrument transformers, to R. E. Updegraff, Seattle, $1,206. J. D. Ross, Light Bldg., 3rd Ave., engr. Bids Nov. 7. Noted Nov. 22, C. D.—Nov. 28, E. N.-R.

TURBINES — **Iroquois Falls, Ont.** — Abitibi Paper & Power Co. Ltd., supplying two 2,100 hp. hydraulic turbines, to Olson & Gibbs, 94 Quebec Ave., Toronto.

FOREIGN

Australia, Port Adelaide—Imperial Chemical Industries, Ltd., London, plans alkali plant. $5,000,000.

Channel Island, Guernsey—Local Legislature authorized purchase of 100 acre site at La-Villiaze for constructing airport.

†*Federal Government.*

Foreign (Continued)

England, Ipswich — Municipality plans constructing 404 houses at Greenwich Estate, $540,000•••Staffs Public Assistance Committee, **Newcastle under Lyne,** voted $1,391,015 for constructing hospital•••Main Sewerage Bd., **Richmond,** voted $700,000 for constructing sewage disposal plant at Mortlake, Howard Humphrey, engr.•••Dec. 30, by F. E. Warbreck Howell, town clk., **Manchester,** supplying and erecting Barton Station, 2 water tube boilers, 200,000 lb. per hr. each, H. C. Lamb, engr. •••**Walsall** Town Council voted $1,100,000 for center town improvement, incl. market hall extensions•••**Darby** Social Housing Committee voted $565,510 for erecting 393 houses on Roe Farm Estate•••**Brentwood** Urban District Council voted $1,165,900 for Shenfield common improvement•••**St. Helens** Health Committee plans constructing 346 houses at Grange Park, $520,000•••**Bradford** City Council erecting 400 houses at Canterbury Ave., $570,000•••John Bowes & Partners, Ltd., **Monkton,** plans coke oven plant, $1,250,000•••R. Fielding & Son, Stanhope Rd., **Blackpool,** in market for 10 ton weigh bridge•••Jan. 3, by I. F. Stringer, clk. Metropolitan Water Bd., 173 Rosebery Ave., E. C., **London,** for portable electric generating units, and portable centrifugal pumping units for Hampton Station.

India—Jan. 16, by Chief Controller of Stores, Indian Stores Dpt., **New Delhi,** supplying one 30 ton electric Goliath crane for locomotive shops at Moghalpure•••Director General, Indian Stores Dpt., Belevedere Rd., Lambeth S.E., London, England, in market for 18 tons copper roads and tubes and brass rod, brass and sheets •••City of **Quetta** plans reconstructing city, incl. building materials, fittings. Application should be made to Director General, Indian Stores Dpt., Belevedere Rd., Lambeth, London, S.E., England.

Japan, Tokio—Ministry of Communications preparing plans for zeppelin factory, $5,000,000.

New Zealand, Wellington—Public Wks. Supply & Tenders Committee bids early in 1936, irrigation scheme at Ashburton, $650,000 voted; irrigation scheme at Maniototo, $3,750,000 voted; reclamation of 92 acres tidal flat at mouth of Hutt River, $865,000 voted; constructing aerodromes, $750,000 voted; and eliminating railway crossings, $1,800,000 voted.

New Zealand, Wellington—Jan. 20, by Auckland Electric Power Bd. for supply of 6,600 volt metal clad compound filled switchgear, 15 sets and 1 self cooled oil immersed, 6,000 kva. transformer; Jan. 21, by Director General Posts & Telegraph Dpt., for supply of 3,000 metal case condensors.

Northern Ireland, Belfast—Tuberculosis Committee plans by R. H. Gibson, constructing sanatorium addition at White Abbey, $530,000.

Scotland—Colvilles, Ltd., Glengarnock, preparing plans extending new blooming mill, and 2 new open hearth melting furnaces, $1,250,000•••**Johnstone** Town Council plans constructing 1,000 houses at Howwood, $1,500,000, T. S. Tait, archt.•••McTaggart & Michel, Ltd., Bath St., **Edinburgh,** plans erecting 364 houses on North Saughton Rd., $511,000.

Scotland—Glasgow City Corporation awards for Dalmarnock Power Station, incl. steam generating plant for turbo-alternators, to Babcock & Wilcox Ltd., Renfrew, $2,455,225; 2 turbo-alternators, 50,000 kw. each, to C. A. Parsons, Ltd., Newcastle, $1,768,850•••British Oxygen Co. Ltd., **Fort William,** preparing plans constructing 4 power houses at Lock Hern, Ceanacree, Invergarry and Invermoriston, high voltgae transmission lines to Corpeck, constructing dams, aqueducts, tunnels, roads and road elevations, $10,000,000•••Fort Augustus, Sir A. Gibb and Partners of London, prepare plans constructing generation station and works at Fort Augustus and 2 other sites, reservoir, enlarging at Loch Quoich and Lock Garry; constructing aqueduct from Loch Cluiane to River Morriston, building reservoirs on River Loyne and River Morriston and aqueduct from Morriston Reservoir to Lock Ness, also road diversions and road raisings, $7,000,000••• Fife County Council, **Fife,** votes for constructing regional water scheme for county, $500,000•••Anglo American Oil Co., **Bowling,** supplying 9 storage tanks capacity, 1,000,000 gal., to Motherwell Bridge & Eng. Co. Ltd., Motherwell, $100,000•••Babcock & Wilcox Ltd., **Dunbarton,** plans extension, $560,000•••Ayrshire Co. Council, **Ayr,** voted $4,747,215 for constructing 2,372 houses•••Navy Dpt., London, plans constructing Royal Navy Arms Depot, **Cromble,** $550,000•••Lanarkshire Co. Council, **Lanark,** voted $2,950,000 for constructing 1,390 houses•••Cattanach & Son, **Wick,** preparing plans for theatre for Caledonian Associated Cinemas, Ltd.

PUBLIC BUILDINGS

PROPOSED WORK

Ariz., Tempe—Arizona State Teachers College, G. Gammage, pres. Bd. Trustees, rejected bids Nov. 15, constructing 2 story women's dormitory. Will readvertise. $125,000. P.W.A. project. Lesher & Mahoney, 1100 Title & Trust Bldg., Phoenix, archts. Noted Oct. 29, C. D.—Oct. 31, E. N.-R.

Calif., Alhambra—Bd. Educ., plans by J. W. Smart, 39 East Main St., improvements to elementary schools. $297,000. M. Erick, 811 West 7th St., Los Angeles, engr. Noted Oct. 24, C. D.—Oct. 31, E. N.-R.

†*Federal Government.*

Calif., Barstow—Barstow Union High School Dist., plans by H. E. Jones, 518 Anderson Bldg., San Bernardino, new high school building, $145,000. Plans bond election in January for same. P.W.A. project. Noted Sept. 16, C. D.—Sept. 19, E. N.-R

★ **Calif, Montebello**—Montebello School Dist., defeated $378,000 bonds to finance new school buildings and reconstructing old buildings. Total $1,000,000. Marsh, Smith & Powell, 508 Architects Bldg., Los Angeles, archts. Noted Dec. 3, C. D.—Dec. 6, E. N.-R.

★ **Calif., San Diego**—City defeated $2,500,000 bonds to render school buildings safe from earthquake. Noted Nov. 19, C. D.—Nov. 21, E. N.-R.

Calif., Santa Ana—Santa Ana Bd. Educ. plans by Allison & Allison, 1014 Edison Bldg., Los Angeles, and F. B. Eley, 109 Orange Ave., Santa Ana, for high school and Lathrop building program. $323,000. Election Dec. 12 to vote $323,000 bonds for same.

Calif., San Francisco — See "Contracts Awarded."

★ **Calif., South San Francisco**—San Francisco-San Mateo Agricultural Dist., c/o W. D. Peugh, archt., 333 Montgomery St., San Francisco, rejected bids Dec. 3, 300x400 ft., rein.-con., steel livestock building, Visitacion Valley. $640,000, ultimate estimate $1,500,000. Noted Oct. 14, C. D.—Oct. 17, E. N.-R.

Calif., Taft—Taft Union High School Dist. plans by W. W. Weeks, 525 Market St., San Francisco, reconstructing main building at Taft High School, $150,000. Voted $150,000 bonds.

Colo., Fort Morgan—Morgan Co. plans by E. F. Redding, 1048 Columbine St., Denver, constructing court house. $100,131. Project approved by P.W.A.

Conn., East Haven (br. New Haven)—Town, School Building Comn., J. H. Corbett, chn. Building Comn., 7 Main St., revised plans by R. W. Foote, 185 Church St., New Haven, 2 story, basement, brick, steel, stone high school, Tyler and Taylor Sts. $418,000. Bids Dec. 2 rejected. Noted Dec. 9, C. D.—Nov. 28, E. N.-R.

Conn., New Britain—City, J. M. Ward, chn. Bd. Educ., plans by M. Unkelbach, 52 North Main St., for Junior High School, brick, steel, $234,000. P.W.A. grant $100,422.

Conn., New London—City, Bd. Educ., postponed construction brick, steel technical high school addition, Waller St. $160,000. Payne & Keefe, 231 State St., archts. City Council voted to reject Federal grant and bond issue financing. Noted Oct. 24, C. D.—Oct. 31, E. N.-R.

Conn., South Windsor—Town, Bd. Selectmen, R. M. Grant, chn. Building Comn., revised plans by W. T. Marchant, 36 Pearl St., Hartford, 2 story, basement, 65x100 ft., brick, steel high school. $125,000. Bids Dec. 7, rejected. Noted Dec. 3, C. D.—Sept. 26, E. N.-R.

Idaho, Boise—City plans by Tourtellottee & Hummel and Wayland & Fennell, Boise, constructing 2 story, basement, 162x326 ft. and 122x144 ft. gymnasium, Lemp Triangle, $450,000.

Kan., Hoisington—City plans power plant and distribution system. $150,000. P.W.A. loan and grant approved. W. B. Rollins & Co., 339 Railway Exch. Bldg., Kansas City, Mo., engrs. Noted July 29, C.D.—Aug. 1, E.N.-R.

Md., Baltimore—Crisp & Edmunds, archts., 409 Calvert Blvd., Baltimore, rejected bids Dec. 6, 4 story, basement hospital building, Calhoun and Fayette Sts., for Franklin Sq. Hospital. $175,000. P.W.A. project.

Mass., Uxbridge—Town, Dr. M. L. Griswold, c/o J. A. Gillis, secy., chn. Building Com., Town Hall, rejected bids Dec. 11, for high school addition. To be refigured. S. W. Haynes & Associates, 336 Main St., Fitchburg, archt. Noted Dec. 5, C. D.—Oct. 17, E. N.-R.

Mich., Ann Arbor—University of Michigan, School of Music, plans by A. Kahn, New Center Bldg., Detroit, concrete, brick, steel, stone campanile tower, and unit of School of Music, plain found., Huron St. $200,000.

Mo., Kansas City—Bd. Educ. plans by C. A. Smith, 800 Finance Bldg., remodeling and constructing 2, 3 and 4 story and basement addition to high school, 15th and Forrest Aves. $300,000.

Nev., Reno—Washoe Co., defeated bonds reconstructing and constructing additions to court house. $285,000. F. J. Longchamps, Gazette Bldg., archt. Noted Oct. 24, C. D.—Oct. 31, E. N.-R.

N. M., Raton—Colfax Co. soon takes bids on revised plans brick, stone, rein.-con. steel court house, jail cells, plain found. $200,000. Townes & Funk, Johnson Bldg., Amarillo, Tex., archt. Former bids rejected. Noted Oct. 24, C. D.—Oct. 31, E. N.-R.

†**N. Y., Attica** — Treas. Dpt. at office Sup. Archt., Wash., D. C., making plans constructing U. S. Post Office, on 117x138 ft. site, Exchange and Main Sts. $90,000. Site purchased.

N. Y., Buffalo—Bd. Supervs. Erie Co. soon takes bids brick, steel county office building, plain found., West Eagle St. $175,000. A. H. Hopkins, Liberty Bldg., archt. P.W.A. funds allotted.

N. Y., New York—Dpt. Hospitals, 125 Worth St., New York, plans by Starrett & Van Vleck, 267 5th Ave., constructing 2 story power plant at Metropolitan Hospital, Welfare Island, opposite East 60th St. $125,000.

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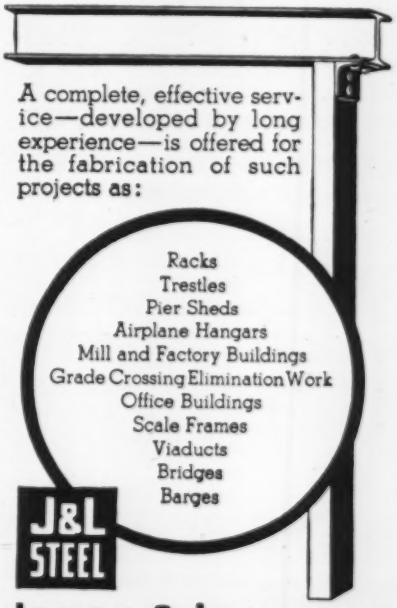
FABRICATED STRUCTURAL WORK BY J&L



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Public Buildings (Continued)

N. Y., Poughkeepsie—Bd. Educ. plans by J. P. Draney, 49 Market St., brick, steel school, plain found., Hamilton St. To exceed $105,000.

N. Y., Tonawanda — Bd. Educ., excavating and foundations for school, to R. E. Williams & Sons Co., Inc., 303 Grote St., Buffalo. P.W.A. Noted Oct. 31, C. D.—Oct. 10, E. N.-R.

N. Y., Union Springs—Union Free School Dist. 2 bids in January, brick, steel school, plain found., $518,000. P.W.A. project. C. W. Clark, 27 North Main St., Cortland, archt.

Pa., Kerrtown—Vernon Twp. School Bd., R. I. Shyrock, pres., plans constructing 1 story school, Kerrtown, $28,000; also 5 room second story brick, steel addition to school at Fredericksburg, $60,000, and auditorium and gymnasium, $22,000.

S. D., Aberdeen—Brown Co., H. Hollien, aud., defeated $74,000 bonds, constructing 2 story, 118x120 ft. county jail, altering court house, etc. $135,000. K. M. Fullerton, 670 Shubert Bldg., St. Paul, Minn., archts. Bids Dec. 10 returned unopened. Noted Oct. 19, 1933, C. D.—Oct. 26, E. N.-R.

Washington—State Hy. Dpt., Olympia, rejected bids Dec. 3, alterations and addition to District Office Building, paint and carpenter shop building, unit 2, Spokane Co.

Alta., Calgary—Dominion Govt. suspends continuance of contract for constructing new barrack buildings. Officials of P. Wks. Dpt., Ottawa, Ont., state that the government's action should not be regarded as final. Noted Oct. 16, C. D.—Oct. 24, E. N.-R.

★ **Man., Winnipeg**—City Council approves as an unemployment relief project erection of general hospital. $2,000,000.

Man., Winnipeg — City defeated $500,000 bonds for housing project. Noted Oct. 30, C. D. —Nov. 7, E. N.-R.

Ont., St. Catharines—Election Jan. 1, $150,000, for new city hall, incl. police station. R. I. Macbeth, 104 Queen St., archt.

★ **Ont., Toronto** — Ontario Provincial Govt. plans constructing steam plant to generate 200,000 hp. electrical energy as a potential safeguard against power shortage. $15,000,000.

BIDS ASKED

†Calif., Santa Barbara—Jan. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office (except elevator). Noted Nov. 26, C. D.—Dec. 5, E. N.-R.

Conn., Southington—Jan. 1, by Southington Hospital Corp., E. S. Todd, pres., 3 story, 35x100 ft., 35x66 ft., brick, limestone hospital, Oakland Rd. and Southington Ave. $105,000. Lester Beach Scheide, Inc., 100 Pearl St., Hartford, archts. A. T. Lindsey, Old Turnpike Rd., assoc. archt. To be built from Julia A. Bradley fund. Noted Nov. 1, C. D.—Nov. 7, E. N.-R.

†Fla., Bay Pines—Jan. 7, by Vet. Administration, Arlington Bldg., Wash., D. C., constructing Veterans Administration Facility, cemetery memorial, incl. marble steps, platform, pylons, etc.

†Ill., Quincy—Jan. 27, at office Sup. Archt., Treas. Dpt., Wash., D. C., extending and remodeling U. S. Post Office and Courthouse. $215,000.

Me., Augusta—Jan. 2, by State, Dr. H. C. Hanscom, dir. Dpt. Health & Welfare, State House, 3 story, basement, brick, steel, stone dormitory, concrete found., at State Hospital. $350,000. P.W.A. project. J. Calvin & John Howard Stevens, 187 Middle St., Portland, archts.

†Md., Belair—Jan. 16, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $60,000. Noted Nov. 22, 1934, C.D.—Nov. 29, 1934, E.N.-R.

Minn., Gaylord—Jan. 2, by Bd. Educ., S. J. Maurer, clk., constructing foundation and superstructure for school. $165,000. P.W.A. project. N. W. Fisher, St. Cloud, archt. Noted Dec. 9, C. D.—Dec. 12, E. N.-R.

Minn., Montgomery—Dec. 31, by Bd. Educ., J. A. Kaisersatt, clk., constructing superstructure for 2 story, basement, brick, cut-stone, steel school. $164,000. Pass & Rockey, Mankato, archts. P.W.A. project. Noted Dec. 2, C. D.—Dec. 5, E. N.-R., under "Contracts Awarded."

Nev., Carson City—Jan. 3, by State, Carson City, constructing and equipping supreme court and state library building. P.W.A. project. F. J. DeLongchamps, Gazette Bldg., Reno, archt. Noted July 31, C. D.—Aug. 5, E. N.-R.

†N. Y., New York—Jan. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Immigration station, shelters and recreation building at Ellis Island.

†N. Y., New York—Dec. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., additional heating in U. S. Parcel Post Building.

★ **N. Y., Whitesboro**—Central Rural School Dist., bids about Feb. 20, constructing school. $500,000. A. F. Gilbert, 258 5th Ave., New York, archt.

†N. D., Grand Forks—Jan. 27, at office Sup. Archt., Treas. Dpt., Wash., D. C., extending and remodeling U. S. Post Office and Courthouse. $205,000.

R. I., Warwick—Dec. 30, by City, Building Comm., 1 story, basement, 90x180 ft., brick, steel equipment terminal, concrete found., Main St. Total est. $109,800. P.W.A. project. E. O. Ekman, 72 Weybosset St., Providence, archt.

†Tex., Bayton—Jan. 15 (extended date), by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $68,000. Noted Dec. 10, C. D.—Dec. 12, E. N.-R.

★ **†Wash., Spokane**—Jan. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing (except elevators) 4 story Post Office, Havermale Island. $650,000. Noted Sept. 25, C.D.—Oct. 3, E.N.-R.

Wis., Black River Falls—Dec. 30, by School Dist. 1, B. K. Konkel, clk., general contract and electrical work for school. $110,000. No bids received Dec. 12 for same. P.W.A. project. Auler, Jensen & Brown, Oshkosh, archts. Plumbing and heating, awarded to Downey Heating Co., 1739 West St. Paul Ave., Milwaukee, $6,596. P.W.A. Noted Dec. 9, C. D.

CONTRACTS AWARDED

Calif., Berkeley—Bd. Educ., Berkeley School Dist., rein.-con., steel, brick school additions, to K. E. Parker, 135 South Park St., San Francisco, $143,725. P.W.A. Bids Nov. 26. Noted Dec. 5, C. D.—Nov. 14, E. N.-R.

Calif., Fullerton — Fullerton High School Dist., 2 story, 70x150 ft., new classroom building on Junior College Site, to J. Strona, Phila. and East End Aves., Pomona, $132,948. P.W.A. Bids Dec. 6, awarded Dec. 9. Noted Dec. 18, C. D.—Oct. 24, E. N.-R.

Calif., Grass Valley—Trustees of Grass Valley Junior High School Dist., rein.-con. school, to E. T. Leiter & Sons, 811 37th St., Oakland, $105,185. P.W.A. Bids Dec. 7, awarded Dec. 10.

Calif., Los Angeles—Bd. Educ., strengthening existing masonry walls, adding bond beams, installing new metal lath and plaster, electric wiring for reconstruction, rehabilitation and strengthening 79th St. School, 7818 McKinley Ave., to H. F. Miller, 1908 West 75th St., $22,392. P.W.A. R. A. De Line, 1144 South Grand Ave., engr. F. D. Hudson, 701 Laughlin Bldg., archt. Awarded Nov. 25.

Calif., Los Gatos — Los Gatos Union High School Dist., 8 classroom and music department addition to high school, to J. D. Carlson, 1331 Sierra Ave., San Jose, $99,737; heating and plumbing, to Scott Co., 113 10th St., Oakland, $9,867. P.W.A. Bids Dec. 5. Noted Sept. 18, C. D.—Sept. 26, E. N.-R.

Calif., Mariposa — Trustees Mariposa High School Dist., general contract frame, stucco high school additions to W. Spivock, 544 Golden Gate Ave., $114,900***electrical work, to American Constr. Co., 462 Bryant St., $6,098 ***heating, to Reeves Heating Co., 959 Natoma St., $13,500. Grand total $134,498. Noted Dec. 3, C. D.—Feb. 21, E. N.-R.

Calif., Salinas—Salinas Junior College Dist., general contract 1 story, wood frame gymnasium to C. L. Wold, 4412 Fulton St., San Francisco, $131,936***electrical work, to C. Langlais, 472 Tehama St., San Francisco, $10,625***plumbing, heating and sheet metal work, to Anderson, Dougherty & Hargis, 225 Main St., $21,243. Grand total $163,804. Est. $120,000. Bids Dec. 12. Noted Oct. 14, C. D.—Oct. 17, E. N.-R.

†Calif., San Diego—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing air station, incl. buildings, roadways, walks, ramp, etc., at Coast Guard Station, to M. H. Golden, 531 Bank of America Bldg., San Francisco, $259,664. Noted Dec. 16, C.D.—Dec. 19, E.N.-R.

Calif., San Francisco—Dpt. P. Wks., City Hall, general contract 1 story, steel, brick, terra cotta gymnasium, to Amoroso & Sons, Wallace and Keith Sts., $97,400***mechanical equipment and plumbing, to Anderson & Rowe, 45 Belcher St., $15,775***electrical work, to Spencer Electric Co., Monadnock Bldg., $3,430. Grand total $116,605. P.W.A. Bids Dec. 4, awarded Dec. 9. Noted Dec. 13, C. D.—Oct. 24, E. N.-R.

†Calif., San Francisco—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing vault entrances at U. S. Mint to Herring-Hall-Marvin Safe Co., Hamilton, O., $27,400. Noted Dec. 2, C.D.—Dec. 5, E.N.-R.

Colo., Pueblo—State, plumbing for five new buildings at State Hospital for Insane, to Park Hill Plumbing & Heating Co., Pueblo, $14,400; heating, to Denver Plumbing & Heating Co., 1225 Glennon St., Denver, $17,700. Noted Dec. 12, C. D.—Dec. 19, E. N.-R., under "Contracts Awarded."

†Conn., Westport — Structural Eng. Corp., general contractors, 110 East 42nd St., New York, excavating for U. S. Post Office, for Treas. Dpt. at office Sup. Archt., Wash., D. C., to Grass Contg. Co., Bridgeport***structural steel, to Porcupine Co., Fairfield St., Bridgeport***reinforcing steel, to J. T. Ryerson Co., 203 Westside Ave., Jersey City, N. J.***cast stone, to Paul & Russell, Marlboro. Noted Sept. 30, C. D. —Oct. 3, E. N.-R., under "Contracts Awarded."

†D. C., Wash. — Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing elevator plant in Archives Building extension, to Westinghouse Electric Elevator Co., 1500 North Branch St., Chicago, Ill., $31,840.

★ **†Fla., Miami**—P. Wks. Administration, Housing Div., Interior Bldg., Wash., D. C., constructing foundations for 62nd Street Housing Project, to Walter Butler Co., New York Bldg., St. Paul, Minn., $929,400. Noted Dec. 2, C.D. —Dec. 5, E.N.-R.

†Ga., Atlanta—Federal Emergency Administration, Housing Div., Wash., D. C., [illegible] ing, planting, sodding at University Housing Project, to Ashford Park Nurseries, Peachtree Rd., $36,620. Bids Dec. 3. Noted Dec. C. D.—Nov. 21, E. N.-R.

†Ill., Chicago—P. Wks. Administration, Housing, Interior Bldg., Wash., D. C., contracting foundations for Diversey Housing Project, to Midwest Constr. Co., 1652 West [illegible] $163,000. Noted Nov. 15, C.D.—Nov. E.N.-R.

†Ill., Chicago—P. Wks. Administration, Housing Div., Wash., D. C., foundations for Julia Lathrop Housing Project, to Henry Ericsson, 228 North La Salle St., Chicago, $11[illegible] Noted Nov. 25, C.D.—Nov. 28, E.N.-R.

★ **Ill., Dunning**—Dpt. Pub. Wks. & Buildings, Springfield, general contract main building at Chicago State Hospital, to M. O. Bein, 1 South LaSalle St., Chicago, $460,800***heating to R. Gordon, Inc., 22 West Austin Ave., Chicago, $29,889***ventilating, to Zack Co., 1 Van Buren St., Chicago, $21,240***plumbing, to M. J. Corboy, 405 North Des Plaines Ave., Chicago, $34,750***elevator equipment, to Westinghouse Electric Elevator Co., 1500 North Branch St., Chicago, $5,168. Grand total $5[illegible] 847. P.W.A. Bids Dec. 2.

Ill., Elgin—Dpt. P. Wks. & Buildings, Architecture, Springfield, general contract employees' building at Elgin State Hospital, to J. E. Ericeson Co., 123 West Madison St., Chicago, $108,943***heating, to Hanley & Co., 1503 South Michigan Ave., Chicago, $7,723*** plumbing, to O'Callaghan Bros., 21 South Green St., Chicago, $21,450. Grand total $138,1[illegible] P.W.A. Bids Nov. 18. Noted Nov. 26, C. D.— Nov. 14, E. N.-R.

Ill., Jacksonville—Dpt. P. Wks. & Buildings, Div. Architecture, Springfield, constructing cottages at School for Blind and dormitories and classrooms for School for Deaf, to J. Simmons Co., 101 North 5th St., Springfield, $102,476 and $197,766 respectively***electrical work, to Hub Electric Co., 2225 West Grand Ave., Chicago, $5,450 and $17,400 respectively ***heating for cottages, to H. P. Reger & Co., 1501 East 77th Pl., Chicago, $11,340***plumbing, to Swords Co., Rockford, $11,574***pipe covering, to Strinkman Sons, Peoria, $3,375*** heating and plumbing for dormitories and classrooms, to Carson Payson Co., Danville, $18,9[illegible] and $18,461 respectively. Grand total $386,79[illegible] P.W.A. Bids Nov. 25. Noted Nov. 15, C. D.— Nov. 21, E. N.-R

Ill., Kankakee—Dpt. Pub. Wks. & Buildings, Div. Architecture, Springfield, general contract ward building Kankakee State Hospital, to C. A. Mosco Constr. Co., 178 West Adams St., Chicago, $89,407***heating, to Gallagher & Speck, 54[illegible] West Harrison St., Chicago, $11,540***plumbing, to Carson Payton Co., Danville, $10,133*** electrical wiring, to Casey Electric Service Co., 1534 West Lake St., Chicago, $3,890***pipe covering, to Illinois Roofing & Insulating Co., 1425 West 42nd St., Chicago, $3,562. Grand total $118,521. P.W.A. Bids Nov. 25. Noted Nov. 29, C. D.—Nov. 21, E. N.-R.

★ **Ill., Manteno**—Dpt. P. Wks. & Buildings, Div. Architecture, Springfield, general contract constructing 24 ward buildings with connecting dining rooms and diagnostic building at Manteno State Hospital, to Patrick Warren Constr. Co., 228 North LaSalle St., Chicago, $1,704,000 and $477,000 respectively***plumbing for 24 ward buildings, to G. E. Mathis & Sons, 56058 South Western Ave., Chicago, $156,765 ***plumbing, sewage and water service, to H. P. Reger & Co., 1501 East 72nd Pl., Chicago, $210,000***pipe covers, to Asbestos & Magnesia Materials Co., 119 North Peoria St., Chicago, $77,280***electric wiring, to Divane Bros., 3826 West Van Buren St., Chicago, $77,950***kitchen equipment, to Duperque Range Co., 1215 Fullerton Ave., Chicago, $28,678*** sterilizing equipment, to American Sterilizing Co., Erie, Pa., $4,895***heating and ventilating and plumbing for diagnostic building, to Klein & Heckman, 108 North Galena Ave., Dixon, $39,279 and $80,492 respectively***pipe covering, to Luse-Stevenson Co., 228 North LaSalle St., Chicago, $12,720***electrical work, to Fries-Walters Co., 2001 West Pershing Rd., $33,000***elevator equipment, to Hollister Whitney, 220 North 11th St., Quincy, $10,450. Grand total $2,931,220. P.W.A. Bids Nov. 7. Noted Nov. 21, C. D.

Ill., Manteno — Dpt. P. Wks. & Buildings, Div. Architecture, Springfield, general contract 2 dormitory buildings and building for tubercular patients at Manteno State Hospital, to J. E. Ericsson Co., 123 West Madison St., Chicago, $192,630 and $78,295 respectively*** pipe covering, to Illinois Fireproof Covering Co., 316 West Kinzie St., Chicago, $4,030 and $4,560 respectively***heating and ventilating for dormitories, to Hanley & Co., 1503 South Michigan Ave., Chicago, $10,792***plumbing, to J. C. Calnan Co., 440 South Dearborn St., Chicago, $15,830***heating for tubercular building, to Klein & Heckman, 108 West Galena Ave., Chicago, $13,631***plumbing, to H. P. Reger & Co., 1501 East 72nd St., Chicago, $16,387***sterilizing equipment, to Scanlon Morris Co., Madison, Wis., $3,679. Grand total $339,834. P.W.A. Bids Nov. 18. Noted Nov. 26, C. D.—Nov. 14, E. N.-R.

Ill., Springfield—Bd. Educ., general contract Feitshans High School, to J. L. Simmons Co., Broadwell Bldg., 101 North 5th St., $141,200

†*Federal Government.*

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Public Buildings (Continued)

•••heating and ventilating, also plumbing, etc., to Carson Payson Co., 616-18 North Jackson St., Danville, $17,596 and $4,365 respectively •••electrical work, to E. A. Koeneman Electric Co., 1408 Delmont Blvd., St. Louis, Mo., $4,600. Grand total $167,761. P.W.A. Bids Dec. 9. Noted Dec. 6, C. D.

Ind., Indianapolis—School Comrs., A. B. Good, dir., 150 North Meridian St., general contract constructing school, East 10th St., to Service Constr. Co., P. O. Box 1101, $162,182•••heating and ventilating, to F. Jantz, 619 Virginia Ave., $29,440•••plumbing, to F. Irish, 2909 East 10th St., $9,494•••electrical work, to Porter Glove & Glass, 215 Hudson St., $7,892. Grand total $209,008. P.W.A. Awarded Nov. 27. Bevington Williams, Inc., 1139 Indiana Pythian Bldg., mechanical engrs., McGuire & Shook, 1401 Fletcher Trust Bldg., archts.

Ia., Atlantic—Independent School Dist., general contract 3 story, basement school, to C. C. Larsen Constr. Co., Council Bluffs, $225,000••• plumbing and heating, to Darrah Plumbing & Heating Co., Cedar Rapids, $40,929•••electrical work to Furlong Electric Co., 907½ Walnut St., Des Moines, $7,694. Grand total $273,623. P.W.A. Bids Dec. 13. Keffer & Jones, 202 Masonic Bldg., Des Moines, archts.

Ia., Cresco—Independent School Dist., general contract repairing and constructing school addition, to J. S. Switzer & Sons, St. Paul, Minn., $75,600•••plumbing, ventilating and heating, to P. J. Gallagher & Son, Faribault, Minn., $26,750•••electrical work, to Metcalf Electric Co., Anamosa, $4,451. Grand total $106,801. P.W.A. Bids Dec. 11. Noted Dec. 5, C. D.

†**Ky., Louisville** — P. Wks. Admistration, Housing Div. Dpt. Interior, Wash., D. C., foundations for Algonquin Housing Project H-2502, to Henry Bickel Co., Inc., 435 Garden St., $53,489. Bids Oct. 31. Noted Oct. 22, C. D.

†**Md., College Park**—Bureau Mines, Wash., D. C., constructing headquarters experimental station, to G. Ryan Constr. Co., 7th and T Sts., N. E., Wash., D. C., $287,000. Bids Dec. 5. Noted Dec 17, C. D.—Nov. 21, E. N.-R.

Md., Salisbury—Wicomico Co., 2 story, basement addition to court house, jail, etc., to Seymour Ruff & Son, 2133 Maryland Ave., Baltimore, $186,600. Est. $170,000. P.W.A. Bids Dec. 6, awarded Dec. 9. Noted Dec. 13, C. D.—Nov. 28, E. N.-R.

★ **Mass., Boston**—City, Dpt. School Buildings, 11 Beacon St., 3 story, basement, 185x289 ft. intermediate school, Phillips Brooks Dist., Dorchester, to Ruzo Constr. Co., Inc., 80 Boylston St., Boston, $684,487. P.W.A. Bids Dec. 5, awarded Dec. 11. Noted Dec. 17, C. D.—Sept. 19, E. N.-R.

Mass., Lawrence—City, City Clerk, City Hall, 2 story, basement, 46x84 ft. administration and nurses' home, Marston St., to L. C. Cyr, 45 Melrose St., $109,770. P.W.A. Bids Nov. 22, awarded Nov. 23. Noted Dec. 2, C. D.—Nov. 19, E. N.-R.

Mass., Danvers—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, building additions at State Hospital, to B. L. Moore, 15 Maple St., Framingham, $20,485•••boilers, boiler settings and oil burner installation, to Acme Heating & Ventilating Co., 13 Hawkins St., Boston, $76,323•••steam piping, to Underground Steam Constr. Co., 75 Pitts St., Boston, $35,670. Grand total $132,478. P.W.A. Bids Dec. 2, awarded Dec. 13. Noted Dec. 10, C. D.—Oct. 17, E. N.-R.

†**Mass., Eastham**—Coast Guard Headquarters, Wash., D. C., general contract 2 story, basement dwelling, boatroom, passageway, etc., at Nauset Coast Guard Station, to F. A. Days & Sons, 24 Pearl St., Provincetown, Mass., $20,972. Bids Nov. 14, awarded Dec. 13. Noted Nov. 20, C. D.

Mass., Framingham—Commonwealth of Massachusetts, Dpt. Educ., State House, general contract classroom and administration building, concrete found., at Teachers College, to Steed, Barber Corp., 7 Water St., Boston, $145,000 •••heating and ventilating, to V. J. Kenneally Co., 251 Causeway St., Boston, $25,120•••plumbing, to Lappin Bros., 17 Irving St., Malden, $8,394•••electrical work, to Jas. Wilkinson & Co., 128 Oliver St., Boston, $11,048. Grand total $189,562. P.W.A. Bids Nov. 20, awarded Dec. 13. Noted Nov. 18, C. D.—Oct. 17, E. N.-R.

Mass., Haverhill—City, J. M. Costello, public property comr., City Hall, 3 story, basement, 43x82 ft., brick, steel, stone, granite addition to Hale Hospital, concrete found., to Walsh Bros., 150 Hampshire St., Cambridge, $169,413. P.W.A. Noted Dec. 12, C. D.—May 30, E. N.-R.

Mass., Northampton—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, general contract 2 story, basement, 40x240 ft. rear center-dining hall and kitchen at State Hospital, to E. J. Pinney Co., Inc., 222 Dwight St., Springfield, $193,054•••heating, to Holyoke Valve & Hydrant Co., 150 Race St., Holyoke, $39,949•••plumbing, to Jas. S. Cassedy, Inc., 133 Austin St., Cambridge, $32,161 •••electrical work, to Kenworthy & Taylor, 11 Spaulding St., Everett, $16,363. Grand total $280,618. P.W.A. Bids Dec. 9, awarded Dec. 13. Noted Dec. 17, C. D.—Oct. 17, E. N.-R.

Minn., Cambridge—Bd. Educ., J. B. Johnson, clk., awarded general contract 2 story, basement, brick, rein.-con. school to J. P. Hagstrom, 1934 Juliet St., St. Paul, $98,875•••heating and plumbing, to Healy Plumbing & Heating Co., 278 West Kellogg Blvd., St. Paul, $24,558••• wiring, to L. M. Grosse, St. Cloud, $4,970. Grand total $128,403. Noted Nov. 13, C.D.—Nov. 21, E.N.-R. P.W.A.

Mo., Chillicothe—State Industrial Home for Girls, Chillicothe, and Bi-Partisan Advisory Bd. to State Building Comn., E. M. Fagan, executive secy., Jefferson City, 2 story, basement, brick, steel reception hall and clinic building to E. C. Childers Constr. Co., Finance Bldg., Kansas City, $112,820. P.W.A. Noted Dec. 16, C.D.—Dec. 19, E.N.-R.

Mo., Excelsior Springs—City, pumps and reconditioning springs, to Layne-Western Co., B. M. A. Bldg., Kansas City, $36,266•••pipe lines and tanks in connection with mineral water development, to Danlap Plumbing & Heating Co., Kansas City, $55,144•••rehabilitating water pavilions and some bathing equipment, to Interstate Constr. Co., Walsix Bldg., Kansas City, $6,948. Grand total $98,327. P.W.A. Bids Sept. 6. Noted Aug. 27, C. D.—Aug. 29, E. N.-R.

Mo., St. Louis—Bd. P. Serv., City Hall, constructing foundations for Colored Community Center building on Vashon Playground, Market St. and Compton Ave., to I. E. Millstone Constr. Co., 4343 Clayton Ave., $12,679. Noted Dec. 16, C.D.—Dec. 19, E.N.-R.

Mont., Dillon—State, Bd. Educ., general contract 3 story, basement, 42x250 ft. dormitory, to Pappin & Son, Great Falls, $129,622•••plumbing and heating, to Northern Plumbing & Heating Co., Denver, Colo., and Helena, Mont., $25,986•••wiring, to Palmquist Electric Co., Helena, $8,489. Grand total $164,097. P.W.A. Bids Dec. 9. Noted Dec. 2, C. D.—Sept. 12, E. N.-R.

†**Mont., Hamilton**—Treas. Dpt. at office Sup. Archts., Wash., D. C., 3 new buildings at Public Health Service's Rocky Mountain Laboratory, to Smythe & Co., 1416 F St. N. W., Wash., D. C., $119,342. Noted July 8, C.D.—July 11, E.N.-R.

Mont., Sidney—School Dist. 5, Richland Co., C. Imes, clk., general contract 3 story, 120x142 ft. school, to J. Holm & A. Rockne, Glendive, $95,980•••plumbing and heating, to S. J. Daniel, Glendive, $19,900•••electrical work, to Rowe Electric Co., Billings, $5,086•••equipment, to Northern Supply Co., Fargo, $5,694. Grand total $126,600. P.W.A. Bids Dec. 7. Noted Oct. 16, C. D.—Oct. 24, E. N.-R.

Neb., Imperial—City, constructing additions to municipal building, Sect. 1, to Fairbanks-Morse Co., Kansas City, Mo., $4,500•••transformers, poles and miscellaneous work, Sect. 4, to Line Material Co., Denver, Colo., $5,774••• gravel treated well, deep well turbine pump, bell and spigot joint, valves and boxes, installing pipe and valves, pump house, furnishing and installing flow meters, Sects. 7 to 13 (inclusive), to Lane-Western Co., Kansas City, Mo. Est. $60,766. P.W.A. Bids Dec. 5. Noted Dec. 3, C. D.

Neb., Minden — City, general contract high school, to W. Knutzen & Son, Kearney, $96,467 •••electrical work, to Electric Shop, Minden, $5,394•••plumbing and heating, to Minden Sanitary Plumbing Co., Minden, $13,050. Grand total $114,911. P.W.A. Bids Nov. 29.

N. H., Greenville—L. H. Shattuck, Inc., general contractors, 208 Granite St., Manchester, heating and plumbing for town hall, to P. C. McAllister, 17 School St., Concord, for Town, Town House Building Com., Main St.; electrical work, to A. L. Franks & Co., 1196 Elm St., Manchester. Noted Dec. 6, C. D.—Feb. 21, E. N.-R.

New Jersey—State Military Bd. State House, Trenton, additions to Salem Armory, to Hadley Constr. Co., Palmyra, $37,452•••Red Bank Armory, to A. A. LaFountain, Inc., 180 Overlook Ave., Hackensack, $53,900•••Westfield Armory, to Gaspar Falco, 530 Riverside Dr., Elizabeth, $44,145•••Orange Armory, to E. M. Johnson, 706 Bergen Ave., Jersey City, $42,470 •••general contract, armory at Eggert's Crossing, to Fowler Thorne Co., 211 North Montgomery St., Trenton, $73,801•••steel and iron, to Foran Fdry. & Mfg. Co., Flemington, $32,539 •••heating and ventilating, to W. E. Bittner, Hamilton Ave., Trenton, $9,530•••plumbing, to G. J. Tobin, 187 North Ave., Plainfield, $6,920 •••electrical work, to P. G. Peiffer, River Rd., Morrisville, Pa. $4,785. Grand total $305,602. Noted Nov. 8, C. D.—Nov. 14, E. N.-R.

★ †**N. J., Atlantic City**—P. Wks. Administration, Div. Housing, Interior Bldg., Wash., D. C., constructing Stanley S. Holmes Village Housing Project, to J. McShain, 1610 North St., Phila., Pa., $1,191,350. Noted Dec. 6, C. D. —Dec. 12, E. N.-R.

†**N. J., Camden** — P. Wks. Administration, Housing Div., Interior Bldg., Wash., D. C., constructing foundations for Westfield Avenue Housing Project, to Turner Constr. Co., Architects Bldg., Phila., Pa., $105,590. Noted Nov. 12, C.D.—Nov. 14, E.N.-R.

N. J., Montclair—Bd. Educ., Town Hall, electrical work for school, to P. H. Jaehnig, 106 Academy St., Newark, $4,876. P.W.A. Awarded Dec. 3. Noted Nov. 20, C. D.—Nov. 28, E. N.-R., under "Contracts Awarded."

N. J., Springfield—Union Co., general contract constructing regional high school, to D. J. Cronin, Inc., Orange, $280,293•••steel and iron, to Breen Iron Wks., 272 Badger Ave., Newark, $30,994•••heating and ventilating, to R. G. Maupai, 62 Hancock Ave., Jersey City, $52,168 •••plumbing, to Carlson-Babcock, Inc., 81 Wallace St., Montclair, $16,764•••electrical work, to Beach Electrical Co., 89 Walnut St., Newark, $29,850. Grand total $410,069. P.W.A. Noted Dec. 3, C. D.—Dec. 5, E. N.-R.

N. J., Trenton—State Dpt. Institutions & Agencies, State House, structural steel, for fireproofing and reconstructing wards Westside Main Building for State Hospital to M. A. K. Burbee, 206 East Hanover St., $85,800. P.W.A. Noted Nov. 22, C. D.—Nov. 28, E. N.-R.

N. M., Clovis—School Dist. 1 brick, rein.-con. high school, plain found., to J. E. Morgan, 210 North Campbell St., El Paso, Tex., $143,273. Est. $125,000. P.W.A. Noted Sept. 21, C. D.—Sept. 19, E. N.-R.

N. Y., Albany—Dpt. P. Wks., Div. Architecture, State Office Bldg., acoustical work in assembly chamber, to H. Hershson Co. Inc., 1860 Bway., New York, $26,525•••air conditioning to Raisler Heating Corp., 129 Amsterdam Ave., New York, $58,770•••electrical work, to Fischback & Moore, 226 East 41st St., New York, $9,550. Grand total $94,845. Bids Dec. 22. Noted May 3, C. D.—May 9, E. N.-R.

†**N. Y., Brooklyn**—P. Wks. Administration, Div., Housing, Interior Bldg., Wash., D. C., constructing foundations for Williamsburg Housing Project, H 1301, to Wallin Concrete Corp., 103 Park Ave., New York, $295,260. Noted Dec. 2, C.D.—Dec. 5, E.N.-R.

†**N. Y., Liberty**—C. Anderson, general contractor, Fort Montgomery, electrical work for U. S. Post Office, for Treas. Dpt. at office Sup. Archt., Wash., D. C., to Leroy A. Busing, Jeffersonville•••lathing and plastering, to Williamsport Plastering Co., Williamsport, Pa.••• roofing, to H. A. Olson, Inc., Parker Ave., Poughkeepsie. Noted Nov. 12, C. D.—Nov. 14, E. N.-R., under "Contracts Awarded."

N. Y., Newburgh—Bd. Educ., foundations for North End School, to J. Biscaglia & Sons, 231 Harrison Ave., Harrison. P.W.A. Bids Nov. 18. Noted Nov. 15, C. D.—Nov. 21, E. N.-R.

★ **N. Y., Newburgh**—Bd. Educ., foundation work for South End Junior High School, Monument St., to W. G. Saltsen, Highland Mills. Total est. $668,250. P.W.A. Noted Nov. 7, C. D.—Oct. 11, E. N.-R.

†**N. Y., New York**—P. Wks. Administration, Housing Div., Interior Bldg., Wash., D. C., constructing foundations for Harlem-Macombs Pl. Housing Project, to Carleton Co., Inc., 500 5th Ave., $213,750. Noted Nov. 29, C.D.—Dec. 5, E.N.-R.

†**N. Y., New York**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing signal system in U. S. Post Office and Court House, to Fischback & Moore, 225 East 41st St., $19,940. Bids Nov. 29. Noted Dec. 16, C. D.—Nov. 21, E. N.-R.

†**N. Y., New York**—Treas. Dpt. at office Sup. Archt., Wash., D. C., general contract U. S. Postal Station B, to Globe Building Corp., 205 East 42nd St., New York, $145,405. Bids Oct. 21. Noted Oct. 22, C. D.—Sept. 26, E. N.-R.

†**N. Y., New York**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing Post Office station, at Madison Sq., to D. M. W. Contg. Co., 2059 Fulton St., Brooklyn, $438,000.

†**N. Y., New York**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing P. O. Station "T", to Tremont Subway Constr. Co., 1912 Arthur Ave., $72,840. Noted July 25, C.D.—Aug. 1, E.N.-R.

N. Y., New York—Dpt. Markets, Municipal Bldg., constructing fish market enclosure for market under viaduct at Park Ave. between 115th and 116th Sts., to S. S. Hirsch, Grand Central Terminal Bldg., $27,350. Bids Nov. 22.

†**N. Y., Schenectady**—P. Wks. Administration, Housing Div., foundations, incl. excavation for Schenectady Housing Project, Bway., Hamilton and Millard Sts., to Hanrahan Bros., 952 Wendell Ave., $74,000. Bids in spring on superstructure. Total est. $2,000,000. Noted Dec. 6, C. D.

N. Y., Troy—Bd. Educ., elevator for Lansingburgh School to Warsaw Elevator Co., Warsaw •••oil burning system, to Walsh No-Kol Co., 40 Sheridan Ave., Albany. P.W.A. Noted Dec. 10, C. D.—Dec. 12, E. N.-R., under "Contracts Awarded."

N. C., Morganton—State, constructing 3 hospital buildings, to Wm. M. Muirhead Constr. Co., Durham, $151,800•••plumbing, to Thompkins Johnson Co., Charlotte, $5,364•••heating, to Morganton Hardware Co., Morganton, $12,750. Grand total $169,914. P.W.A. Bids Nov. 30. Noted Dec. 9, C. D.—Oct. 3, E. N.-R.

O., Ironton—Lawrence Co., H. W. Mountain, chn., site preparation, excavation, rough grading, concrete footings, foundations for hospital on South 9th St., to Chappalear Contg. Co., Portsmouth, $13,696. P.W.A. Noted Dec. 10, C. D.—Dec. 12, E. N.-R.

O., Jamestown—Bd. Educ. Silvercreek Twp., constructing 2 story, brick, rein.-con. school building, to A. P. Eveland, Co., Wilmington, $129,696; heating and ventilating, to Richards, McNain Co., Springfield, $16,646. P.W.A. Noted Nov. 18, C.D.—Nov. 21, E.N.-R.

O., Monroe—Lemon Twp. Bd. Educ., W. C. Ible, clk., Mason, constructing school, to Benzing & Sons, 709 South 9th Ave., Hamilton, $116,000•••plumbing, to J. Arpp Plumbing Co., 920 Central Ave., Middletown•••electrical work, to Barnhart Electric Co., Illinois Ave., Middletown•••heating and ventilating, to Columbus Heating & Ventilating Co., 400 Dublin Ave., Columbus. Est. $114,214. P.W.A. H. W. Goetz, Middletown, archt.

†*Federal Government.*

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Public Buildings (Continued)

O., Painesville—Bd. Educ., constructing brick, steel, concrete new school building and addition to present structure, to Payne & Beymer, Painesville, $116,531. **P.W.A.** Awarded Dec. 11.

★ **O., Toledo**—Bd. Educ., (a) general contract (b) heating and plumbing (c) electrical work (d) temperature regulation (e) heating (f) plumbing in (1) Segur School (2) Roosevelt School addition (3) Old Orchard School (4) Cottonwood School (5) Evansdale School (6) Starr Ave. School (7) East Side Central School auditorium (8) Spring School addition, to H. J. Spicker, 1418 Elms St, (a1) $232,682***to W. G. Coyle, 535 Knower St., (b1) $49,917***to Romanoff Electric Co., 105 Broadway (c1) $8,400 (c4) $1,648 (c5) $2,662 (c6) $2,885 (c8) $2,196***to Barber Coleman Co., Toledo (d4) $1,139 (d5) $1,663 (d6) $1,672***to H. C. Baker Co., 128 South St. Clair St. (b3) $45,290 (b4) $17,350 (b7) $25,140***to D. MacDermid, 309 West Bancroft St., (b2) $10,295 (b8) $12,690***to Pioneer Plumbing & Heating Co., 136 West Woodruff St. (c5) $16,028***to J. Thom, 740 Prouty Ave. (f5) $6,433 (f6) $6,420*** to Overmyer Electric Co., Toledo (c2) $1,795 (c3) $6,399 (c7) $3,016 ***to Johnson Service Co., Terminal Bldg., (d1) $2,632 (d3) $3,547***to N. S. Larsen Co., River Rd. (e6) $15,533***to Comte Naumann Co., 912 Summit St. (a4) $52,200 (a5) $74,000 ***to Kopitke Constr. Co., 321 Wabash Ave. (a2) $49,420 (a3) $186,200***to Watts Suhrbier Co. Toledo (a7) $56,568 (a8) $43,981*** to H. J. Suhrbier, 425 Shasta Dr. (a6) $73,886. Grand total $1,014,057. P.W.A. project. Noted Dec. 11, C.D.—Dec. 19, E.N.-R.

Okla., Ada—Bd. Affairs, Capitol, Oklahoma City, constructing 2 story, basement, brick, rein.-con. dormitory, plain found., on campus, Ada Teachers College, to Price & Kernus, 605 West Main St., Oklahoma City, $379,973. Est. $363,636. **P.W.A.** Bids Nov. 20. Noted Nov. 8, C. D.—Nov. 14, E. N.-R.

Okla., Claremore—Bd. Affairs, general contract 1 story, basement, 62x130 ft., brick, steel auditorium and gymnasium, plain found., for Oklahoma Military Academy, to Manhattan Constr. Co., 1st Natl. Bank Bldg., Oklahoma City, $193,327. **P.W.A.** Bids Nov. 30, awarded Dec. 11. Noted Nov. 26, C. D.—Nov. 7, E. N.-R.

Okla., Clinton—Bd. Affairs, Capitol, Oklahoma City, general contract 2 story, basement, brick, rein.-con. ward buildings, concrete found., at Clinton Tubercular Hospital, to D. C. Bass & Sons, Enid, $136,053. **P.W.A.** Awarded Dec. 10.

★ **Okla., Oklahoma City**—City, general contract 6 story, basement, brick, steel city hall, plain found., Hudson St., to C. M. Dunning Co., 420 North Hudson St., $591,342. **P.W.A.** Bids Nov. 20, awarded Dec. 12. Noted Dec. 16, C. D.—Nov. 7, E. N.-R.

Okla., Weatherford—State Bd. Affairs, Capitol, Oklahoma City, general contract 2 story, basement, brick, rein.-con. new dormitory, plain found., to Dennehey Constr. Co., 514 West Noble St., Oklahoma City, $292,913. **P.W.A.** Bids Nov. 20. Noted Nov. 8, C. D.—Nov. 14, E. N.-R.

Ore., Milwaukee—School Dist., general contract high school, to O. E. Waynman, Couch Bldg., Portland, $109,000. Noted Nov. 6, C. D.

Ore., Pendleton—Jones & Marsh, archts., Woodlark Bldg., Portland, constructing high school and Vert Memorial Community Building, to W. and L. L. Quigley, Portland, $72,000 and $140,000 respectively. Noted Dec. 5, C.D.

†Pa., Mauch Chunk—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to W. F. Sutter, 835 East 3rd St., Nescopneck, $38,800. Noted Sept. 10, C.D.—Sept. 12, E.N.-R.

★ **Pa., Phila.**—Public Educ., Administration Building, to McCloskey & Co., 1620 West Thompson, elementary school Haines St. East of Germantown Ave., $333,890; elementary school, 5th and Federal Sts., $403,583; elementary school, 18th and Oxford Sts., $348,402; elementary school, 22nd and Moore Sts., $365,928. Grand total $1,451,803. Bids Dec. 10. Noted Nov. 8, C.D.—Nov. 14, E.N.-R.

†Pa., Phila.—P. Wks. Administration, Housing Div., Interior Bldg., Wash., D. C., constructing foundations for Hill Creek Housing Project, to W. E. Wark & Co., 1608 Walnut St., $91,570. Noted Nov. 18, C.D.—Nov. 21, E.N.-R.

Pa., Warren—Bd. Educ., constructing additions to and improvements at 5 schools, general contract, to A. Wishart & Sons Co., Sharon, $133,239***heating and ventilating, also plumbing, to W. M. Clark & Co., New Castle, $62,894 and $9,100 respectively***electrical work, to C. Beckley, Warren, $7,175. Grand total $212,408.

†Pa., Wayne—P. Wks. Administration, Housing Div., Interior Bldg., Wash., D. C., constructing foundations for Highland Ave. Housing Project, to McCabe Bros., Bala-Cynwyd, Phila., $19,000. Noted Dec. 19, C.D.—Dec. 12, E.N.-R.

★ **R. I., Burrillville**—State, Emergency P. Wks. Comn., State House, Providence, general contract 4 story, basement, 45x260 ft., with 41x84 ft., 64x148 ft. and 45x108 ft. wings hospital and administration building, to Tucker Constr. Co. and C. T. Wills, 348 Westminster St., Providence. $564,100***heating and plumbing, to Frank Dupuis Co., 599 Main St., Pawtucket, $32,563 and $72,217 respectively***electrical work, to Scannevin & Potter, 189 Pine St., Providence. $50,560*** elevator, to A. B. See Elevator Co., Inc., 164 Stuart St., Boston, Mass., $20,116. Grand total $739,556. **P.W.A.** Bids Dec. 9, awarded Dec. 13. Noted Dec. 17, C. D.—Dec. 5, E. N.-R.

R. I., Providence—Jas. Stewart & Co., contractors, 230 Park Ave., New York, 500 tons structural steel, in connection with school construction, North Main, College and Benefit Sts., to J. H. Towers Iron Wks., for Rhode Island School of Design. Noted Nov. 25, C. D.—Nov. 28, E. N.-R., under "Contracts Awarded."

†S. C., Charleston—P. Wks. Administration, Housing Div., Interior Bldg., Wash., D. C., constructing foundations for Meeting Street Housing Project, to Tidewater Constr. Co., Charleston, $141,861. Noted Dec. 2, C.D.—Dec. 5, E.N.-R.

†S. C., Charleston—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing hangar, barracks, radio garage building, timber ramp, etc., at U. S. Coast Guard Station, to A. Blair, Montgomery, Ala., $231,360. Noted Oct. 15, C.D.—Oct. 17, E.N.-R.

S. D., Rapid City—Bd. Educ., H. N. Johnson, clk., general contract 2 story, basement, 150x200 ft., brick, steel school addition, to Northwestern Eng. Co., Rapid City, $275,400 ***plumbing and heating, to Rapid City Plumbing Co., Rapid City, $50,896***wiring, to Rapid City Electric Co., Rapid City, $10,877. Grand total $377,173. **P.W.A.** Bids Dec. 6. Noted Nov. 1, C. D.—Nov. 7, E. N.-R.

Tenn., Nashville—Bd. P. Wks., constructing 2 story, brick, steel, concrete city market to Foster & Creighton, American Natl. Bank Bldg., $217,950. **P.W.A.** Bids Dec. 5, awarded Dec. 11. Noted Dec. 12, C. D.

†Tenn., Nashville—P. Wks. Administration, Housing Div., Interior Bldg., Wash., D. C., constructing foundations for Eighth Avenue Housing Project, to D. L. Nickelson, Nashville, $66,900. Noted Nov. 19, C. D.—Nov. 21, E. N.-R.

†Va., Cobb Island—U. S. Coast Guard, constructing dwelling, to Garfite Eng. Co., Wash., D. C., $47,777.

Washington—State Hy. Dpt., Olympia, constructing addition to District Office Building, Yakima Co., Unit 1, to W. M. Yeaman, 603 South 1st St., Yakima, $17,427.

Wash., Arlington—School Dist. 324, Snohomish Co., general contract, 3 story, 140x204 ft. high school, to N. McDonald, Lloyd Bldg., Seattle, $145,102***electrical work, to Martime Electrical Mach. Co., 913 Western Ave., Seattle, $8,430***plumbing, to A. J. Blythe Plumbing & Heating Co., 1313 Railroad Ave., Bellingham, $29,654. Grand total $183,186. **P.W.A.** W. Mallis, Lyon Bldg., Seattle, archt. Noted Dec. 18, C. D.—Dec. 26, E. N.-R.

Wash, Bellingham — State Normal School, general contract 2 story, 95x120 ft. physical education building, 30x75 ft. wing, to Henrikson-Alstrom Constr. Co., Textile Tower, Seattle, $139,790***heating, plumbing, ventilating, to Tegenfeldt & Farquharson, 204 Eastern Magnolia St., $42,699***electrical work, to NePage McKenny Co., 804 6th St. S., Seattle, $7,195. Grand total $189,684. Noted Nov. 27, C. D.—Dec. 5, E. N.-R.

Wash., Bellingham—School Dist. 301, repairing Whatcom High School, Larabee, Silver Beach, Washington, Roeder, Lowell and Sehome grade schools, to F. Headrick, 1714 State St. $46,279. **P.W.A.** Wohleb & Stanton, Herald Bldg., archts. Noted Dec. 2, C. D.

Wash., Cheney — City, general contract, 2 story, training school, to A. F. Mowat, 1331 3rd Ave. Bldg., Seattle, $188,936***plumbing and heating, to A. G. Rushlight & Co., South East Morrison St., Portland, Ore., $23,757*** electrical work, to Tinling & Powell, Spokane, $9,800. Grand total $222,493. Bids Dec. 8. **P.W.A.** Noted Nov. 22, C. D.—Nov. 28, E. N.-R.

Wash, Medical Lake—City, general contract 3 story, basement, 44x174 ft. women's ward building, Eastern State Hospital, to Sheble Constr. Co., 2019 3rd Ave., Seattle, $112,970; plumbing, J. Smythe, 228 Division St., Spokane, $10,250. P.W.A. grant $34,000. Noted Dec. 18, C. D.—Dec. 26, E. N.-R.

Wash., Skykomish — King Co., Dist. 192, general contract, grade school, to W. Peterson, 2940 East Lake, Seattle, $89,931; plumbing, to Ashwell-Twist, 967 Thomas St., Seattle, $17,134. **P.W.A.** Noted Nov. 29, C. D.

†W. Va., Welch—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to David Gordon Building Co., 3493 Burnet Ave., Cincinnati, O., $79,870. Noted Dec. 3, C. D.—Dec. 5, E. N.-R.

Wis., Arkansaw—Union Free High School, excavating for school addition, to Percy Murry, Arkansaw. $289. **P.W.A.** Bids Dec. 11, awarded Dec. 11.

Wis., Black River Falls—See "Bids Asked."

Wis., Lomira—Joint School Dist. 5, constructing foundation for school, to F. G. Bartell, St. Cloud, Minn., $3,492. **P.W.A.** Bids Dec. 7. F. J. Stepnoski, Fond du Lac, archt.

★ **†Wis., Milwaukee**—P. Wks. Administration, Div. Housing, Interior Bldg., Wash., D. C., constructing Parklawn Housing Project, to Geo. A. Fuller Co., 111 West Washington St., Chicago, Ill., $2,238,500. Noted Oct. 31, C. D.—Nov. 7, E. N.-R.

Wis., Pewaukee—School Dist. 1, excavation and moving barracks for gymnasium and remodeling school, to F. Anderson, Pewaukee, $1,050. Bids Dec. 12, awarded Dec. 12. Noted Dec. 9, C. D.—Aug. 1, E. N.-R.

Wis., Waukesha—Bd. Educ., substru... 83x180 ft. high school addition, to ... Constr. Co., 803 East Wisconsin Av... waukee, $5,799. **P.W.A.** Bids Dec. 11... ed Dec. 11.

†Puerto Rico—P. Wks. Administrati... Housing, Interior Bldg., Wash., D. C., co... ing Caserio Mirapalmeras Housing Pro... Salvador Quinones, San Juan, $34,770. ... Dec. 13, C.D.—Dec. 19, E.N.-R.

Ont., Ottawa—Ont. Hydro-Electric ... Comn., Toronto, conversion of Chats Falls ... from 25 to 60 cycle power, at Chats ... near here, to Canadian Westinghouse Co ... Hamilton. Awarded Dec. 2.

COMMERCIAL BUILDING

PROPOSED WORK

Calif., Long Beach—I. E. Loveless, ... 102 South Robertson Blvd., Beverly Hills, ... lets contract 4 story, 126x147 ft. main bu... incl. offices, pharmacy, laboratory, dining ... kitchen and surgical foyer, etc., and 30x... laundry, 10th St. and Linden Ave., for ... of Incarnate Word, 1060 Linden Ave. ... $255,000.

Ill., Chicago—Mrs. Gertrude Packer, ... Kedvale and Montrose Aves., plans apartment, North Kedvale and Montrose Aves. $100,...

N. J., Maplewood — Warner Road Bui... Co., c/o R. S. Darling, East Orange, pla... and 2 story, brick dwellings, Wyoming ... Durand Rds. $100,000 or more. Archi... not appointed.

N. J., New Brunswick—Walter Reade, ... 7th Ave., New York, plans by T. W. L... 701 7th Ave., New York, theatre, Albany ... $400,000. **Maturity later.**

N. Y., Cortland—Owner, c/o P. M. Hul... & L. T. Strong, 505 Savings Bldg., Lima, ... plans nearing completion constructing, ... ing theatre and remodeling department store.

N. Y., Jackson Heights—Corporation, L. ... Rogovin, 485 Ocean Ave., Brooklyn, plans ... story apartment, Fillmore Ave. and 72nd ... To exceed $125,000. Architect not appoin...

N. Y., Jamaica—Wolosoff Bros., 69-50 In... gram St., Forest Hills, plans constructing gro... 46 dwellings, Grand Central Parkway ... Daniel St. $100,000 or more. Architect ... appointed.

N. Y., New York—Gerard Properties, I... 612 West 145th St., plans by J. M. Felson, ... West 57th St., New York, 6 story apartment, 176th St. and Monroe Ave. $125,000.

N. Y., New York—Corporation, c/o I. ... Geller, 122 East 42nd St., plans 6 story apart... ment, Holland and Arnow Aves. $100,000. Site acquired. Architect not appointed.

N. Y., New York—J. Sager, 612 West 145th St., plans 6 story apartment, 176th St. and Monroe Ave. $125,000. Architect not appointed.

N. Y., New York—Leroy-Haven, Inc., 565 5th Ave., plans by H. Ginsbern, 205 East 42nd St., constructing 6 story store and apartment, Grand Concourse and 181st St. $250,000.

N. Y., New York—New York State Realty & Terminal Co., 466 Lexington Ave., plans by Walker & Gillette, 599 Madison Ave., alterin... 12 story, restaurant, store and apartment, 400 Park Ave. $200,000.

N. Y., Sands Point (Port Washington, P. O.) —Sands Point Homes, Inc., Old Sands Point Rd., plans developing 184 acre tract, incl. group dwellings, Old Sands Point Rd. $100,000 or more.

N. C., Winston-Salem—F. W. Woolworth Co. Woolworth Bldg., New York, N. Y., plans by E. A. Winters, 233 Bway., New York, N. Y. constructing department store, distribution and storage building. To exceed $100,000. Noted Nov. 29, C.D.—Dec. 5, E.N.-R.

O., Cleveland—Ohio Bell Telephone Co., G. A. Kositsky, ch. engr., 750 Huron Rd., plans being completed by Hughes & Conrad, Hanna Bldg., 2 story, basement, 115x115 telephone exchange, East 107th St. and Wilbur Ave. $250,000.

Pa., Pittsburgh—Pittsburgh Mercantile Co., 2600 Carson St., plans by G. O. Rodgers, 528 4th Ave., 6 story, 34x120 ft. store extension, new elevator and shaft, new fire tower, steel bearing upper superstructure, rein.-con. found.

Tex., Corpus Christi—R. and R. Theatre Co., Inc., Corpus Christi, sketches by architect, c/o owner, fireproof theatre. $300,000.

★ **Ont., Toronto** — Toronto Stock Exchange, 234 Bay St., plans 3 or 4 story, 97x110 ft. stock exchange building, Bay St. $550,000. Architect not appointed.

BIDS ASKED

N. Y., Bayside—See "Contracts Awarded."

CONTRACTS AWARDED

D. C., Wash.—Y.W.C.A., 17th and K Sts., Wash., D. C., general contract 8 story, Y.W.C.A. addition, to W. P. Lipscomb Co., District Natl. Bank Bldg. Est. $200,000.

Mass., Salem—Holyoke Mutual Fire Insurance Co., A. Smith, agt., 114 Washington St., 3 story, basement, 33x66 ft. and 43x86 ft., brick, stone, granite and marble office building, concrete found., Crombie and Norman Sts., to Lawson W. Oakes, Inc., 100 Halleck St., Bos-

Constr. News page 103

†Federal Government.

Commercial Buildings (Continued)

ton. To exceed $105,000. Bids Nov. 29, awarded Dec. 12. Noted Nov. 25, C. D.—Aug. 22, E. N.-R.

Ind., Bloomington—Bd. Trustees Indiana University, J. W. Cravens, secy., general contract 3 story, basement school of music, to Leslie Colvin, 803 Electric Bldg., Indianapolis, $277,970***plumbing, to R. M. Cotton, 1720 East 10th St., Indianapolis, $8,713***heating, to F. Fenneman, Bloomington, $32,713***electrical work, to Sanborn Electric Co., 309 North Illinois St., Indianapolis, $19,535***Warner Elevator Co., 2613-31 Spring Grove St., Cincinnati O., $2,695. Grand total $341,831. P.W.A. Bids Dec. 3. Noted Dec. 16, C. D.—Nov. 28, E. N.-R.

N. Y., Bayside—Gross-Morton Corp., 160-16 Jamaica Ave., Jamaica, constructing group fifty-four 1 story, 25x44 ft. and 23x26 ft., frame dwellings, at 213th St. from 50th to 53rd Sts., day labor and separate contracts. $170,000. Maturity at once. A. E. Allen, Garden City, archt.

N. Y., Rochester—Colgate Rochester Divinity School, 1100 South Goodman St., general contract constructing dormitory for missionaries, dormitory for married students and chapel, South Goodman St., to A. W. Hopeman & Sons Co., 569 Lyell Ave. Bids Nov. 9. Noted Nov. 7, C. D.—Oct. 31, E. N.-R.

N. Y., Tonawanda—R. C. Dewey Co., 1105 Colvin Blvd., Kenmore, painting 60 residences, to G. C. Arnold, 1314 Ferry St., Buffalo. Noted Dec. 2, C. D.—Dec. 5, E. N.-R., under "Contracts Awarded."

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., Long Beach—FACTORY—Ford Motor Co., 700 Ford Ave., plans by Parkinson & Parkinson, 808 Title Insurance Bldg., Los Angeles, altering 5 story, Class A brick, concrete factory building, consisting of removing present floor topping and replacing same with rein.-con. gunite topping, enlarge column capitols and build new drop heads all of reinforced gunite, 2060 East 7th St. $50,000.

Calif., San Francisco—PLANT—Pacific Steel Fdry Co., 18th and Treat Sts., plans repairing and altering plant, 18th and Treat Sts., recently damaged by fire. $35,000 or more. Architect not appointed.

Calif., Scotia—PLANT—Pacific Lumber Co. plans rebuilding burned unit of lumber plant. To exceed $30,000. Architect not appointed. Fire loss $100,000.

Conn., Bridgeport—PLANT—Casco Products Corp., 1333 Railroad Ave., plans by Fletcher-Thompson Inc., 1336 Fairfield Ave., 1 story, 84x188 ft., brick, steel plant addition Railroad Ave. $35,000.

Conn., Bridgeport—FACTORY—Hemco Moulding Div., Bryant Electric Co., H. E. Seim, genl. mgr., State St., plans by Fletcher-Thompson, Inc., 1336 Fairfield Ave., 1 story, 90x200 ft. brick plant for manufacturing plastic mouldings for electric devices, Railroad Ave. $80,000.

Ind., Bloomington—POWER PLANT—Indiana University, soon takes bids power plant addition. $40,000 or more with equipment. C. R. Ammerman, 172 Century Bldg., Indianapolis, engr.

Ind., Fort Wayne — BREWERY — Berghoff Brewing Corp., Fort Wayne, plans plant extensions. $120,000.

Ind., Vincennes—STORAGE, etc.—J. C. Penney Co., 330 West 34th St., New York, N. Y., and Vincennes, plans repairs and alterations to storage building and store. Est. about $100,000. Architect not appointed.

Ky., Frankfort—BOTTLING PLANT—Labrot & Graham, Glenn's Creek Rd., plans constructing bottling plant. $40,000.

Ky., Lexington — WAREHOUSE — Schenley Products Co., 20 West 40th St., New York, plans by C. J. Kiefer, archt. and engr., Schmidt Bldg., Cincinnati, O., bonded warehouse, at Jas. E. Pepper Distillery. $200,000. Noted Dec. 3, C. D.—Dec. 5, E. N.-R.

Mich., Dearborn—POWER PLANT—Ford Motor Co., Dearborn, plans addition to power plant. Giffels & Vallet, 1000 Marquette Bldg., Detroit, archts.

Mich., Mt. Clemens — FACTORY — Covered Wagon Co., 11900 East Jefferson St., Detroit, plans altering plant into trailer factory. $50,000.

Mich., Muskegon—REFINERY—Naph-Sol Refining Co. plans altering refinery. $40,000 or more.

Mo., Mexico—PLANT—Mexico Refractories Co. plans improving plant. $50,000.

N. J., Kearny—PLANT—Co-Op-Grange Mills, Chamber Commerce Bldg., Buffalo, plans reconditioning former Valentine Varnish Co. plant for own use. $50,000.

N. M., Albuquerque—BOTTLING PLANT—Nehi-Dr. Peper Bottling Co., 821 South 3rd St., soon lets contract 1 story, 100x120 ft., brick bottling plant, Coal Ave. near 2nd St. $30,000.

N. Y., Buffalo — LABORATORY — Colonial Radio Corp., 254 Rano St., made plans 1 and 2 story, 25x100 ft. addition, Rano St. Private plans.

N. Y., New York—STORAGE—West End Holding Corp., M. L. Sloane, pres., 140 West End Ave., plans storage, 140 West End Ave. To exceed $40,000. Architect not appointed.

N. Y., Warsaw—PLANT—Brown Knitting Co., C. Derrick, mgr., purchased former Marr & Cotton (organ manufacturing plant), and plans altering and improving same to house its Chattanooga, Tenn., branch which is to be abandoned. $28,500 or more. Maturity at once.

★ **N. C., Enka** — PLANT — American Enka Corp., A. J. L. Moritz, in charge, plans repairing, reconstructing plant and replacing equipment. $500,000. Private plans.

N. C., Greensboro—MILL—Guilford Hosiery Mills, 2 story addition to hosiery mill, incl. dyehouse and storage, all separate contracts awarded. Est. exceeds $30,000.

O., Granville—Dennison University, foundation and excavation for library, to Hawkins Constr. Co., Newark. Total est. $200,000. General contract bids about Jan. 15. W. Gehron, 101 Park Ave., New York, archt.

O., Lorain—STORAGE—Lorain Produce Co. plans storage. $30,000 or more. Maturity indefinite. Architect not appointed.

O., Toledo—PLANT—Elmira Precision Tool Corp., c/o W. P. Rodgers, 615 Penn Ave., plans by C. C. Hunter, 567 Riverside Ave., altering part of former Willys Overland plant property for company's use. $100,000 with equipment.

Okla., Enid — SERVICE—Minneapolis-Moline Power Implement Co., 29th St. and Minnehaha Ave., Minneapolis, Minn., soon lets contract constructing service building and plant. $40,000.

Ore., Milton—POWER PLANT—Milton Box Co. plans enlarging power plant and other alterations, incl. boilers, turbine and replacing kilns with more modern ones.

Pa., Pittston — MILL — Bentley Silk Mills, Pittston, plans mill. To exceed $30,000. Maturity indefinite. Architect not appointed.

S. C., Anderson—STORAGE— G. F. Tolly & Son plans rebuilding furniture storage, service and showroom building, destroyed by fire, Whitner and McDuffie Sts. To exceed $50,000. Architect not appointed.

S. D., Sioux Falls—GROCERY STORAGE, etc.—Nash-Finch Wholesale Grocery & Fruit Co., Sioux Falls, plans altering and repairing grocery and storage. To exceed $30,000.

Tenn., Memphis — BOTTLING PLANT — Dr. Pepper Bottling Co., 763 Madison Ave., plans altering and equipping buildings for bottling plant and remove present works to this site, 980 Jefferson Ave. To exceed $28,000.

Tex., Dallas—BREWERY—C. A. Zilker, 519 West Ashby St., San Antonio, plans 40 ft. high, brick, rein.-con., brewery, plain found. $175,000. Private plans, c/o Owner. (Local architects).

Tex., McAllen—WAREHOUSE—H. E. Butt, McAllen, plans 1 story, 40x90 ft., brick Piggly-Wiggly Chain warehouse and store building, plain found. $60,000. Site purchased.

Tex., Moore—PLANT—United Carbon Co., Charleston, W. Va., plans carbon black plant. $30,000 or more.

Tex., Orange—PLANT—Equitable Paper Bag Co., 341 Scholes St., Brooklyn, N. Y., plans plant improvements. $125,000. F. L. Smith, 21 East 40th St., New York, engr.

★ **Utah, Salt Lake City**—POWER PLANT—Utah Power & Light Co., Kearns Bldg., plans auxiliary steam power plant. To exceed $1,000,000. J. A. Hale, c/o owner, ch. engr.

Va., Appalachian — STORAGE — Virginia Wholesale Co., plans storage plant. To exceed $100,000. Maturity indefinite. Architect not appointed.

Wash., Seattle—BREWERY—Horluck Brewing Co., Westlake Ave. and Mercer St., plans by McClelland & Jones, Republic Bldg., present structure to be extended to Westlake Ave. and 18 new concrete, stone storage tanks, new capacity 4,000 bbls. Est. $50,000. Noted Feb. 28, C. D.—Mar. 7, E. N-R

Wash., South Bend—LUMBER MILL—C. L. Lewis plans constructing lumber mill, 60,000 board ft. capacity. To exceed $30,000.

W. Va., Granville — PLANT — American Oil Co., American Bldg., Baltimore, Md., plans constructing distribution plant on left bank of Monongahela River near Granville, incl. concrete dolphins and 6 in. pipe line. To exceed $28,500.

Wis., Fond du Lac—GAS PLANT—Wisconsin Power & Light Co., 122 West Washington St., Madison, bids in April, constructing gas plant addition. $150,000.

Alaska—GOLD MINING—Alaska Hurrah Gold Mines, c/o T. T. Lane, Seattle, Wash., plans gold mining development. To exceed $100,000.

Alaska, Eyak—CANNING PLANT—Pioneer Sea Foods Co., Eyak, plans canning plant and storage, here or other location. To exceed $50,000. Architect not appointed.

Alta, Calgary — PLANT — British American Oil Co., c/o L. E. Wooley, Royal Bank Bldg., Toronto, Ont., soon lets contract gasoline plant (absorption unit), in South Turner Valley, in vicinity of here. $300,000.

★ **Ont., Copper Cliff** — SMELTER — International Nickel Co. of Canada, R. C. Stanley, pres., plans addition to smelter, incl. 2 new furnaces, 8 converters with auxiliaries, air lines and electrical equipment and large new chimney stack. $6,000,000. Owner's engineers will supervise work.

★ **Ont., Kitchener**—COKING PLANT—Grant Eng. Co., 1164 Beaver Hall Sq., Montreal, Que., plans constructing coking plant 3 mi. east of city, Hy. 7. $800,000.

Ont., Ottawa — PLANT — A. M. Maillard, Paris, France, appoints E. R. E. Chevrier, M. P., K. C. 45 Riedau St., as his agent to purchase site in Ontario for constructing manufacturing plant of beauty products and perfumes.

Ont., St. Catharines—FOUNDRY—McKinnon Industries Ltd., Ontario St., H. Carmichael, pres., bids about Jan. 15, constructing 1 story, 322x360 ft., brick, steel foundry addition, incl. sprinkler and ventilating systems. A. E. Nicholson, 46 Queen St., archt. Noted Nov. 12, C. D.—Nov. 14, E. N.-R.

BIDS ASKED

Wis., Milwaukee — BREWERY — J. Schlitz Brewing Co., 235 West Galena St., taking bids superstructure for "E" storage building, 6 story, 87x101 ft., North 3rd St. Foundations awarded to S. N. Siesel Co., 5148 East Ogden Ave. J. G. Schier, c/o owner, archt.

CONTRACTS AWARDED

Calif., Richmond—TURBINES—Standard Oil Co. of California, 225 Bush St., San Francisco, turbines for steam power plant, to contain 3 steam boilers with maximum working pressure of 900 lb. per sq.in. and capable of generating 125,000 lb. steam per hour, three 4,000 kilowatt steam turbine generators, etc., to General Electric Co., Russ Bldg., San Francisco. Noted Oct. 8, C. D.—Oct. 10, E. N.-R., under "Contracts Awarded."

Conn., Danbury—SERVICE—B. Dolan, general contractor, Bethel, plumbing for brick, steel service station, to W. T. Wright & Co., Main St., Bethel, for George A. Lewis Co., 325 Main St.; electrical work, to E. J. Wood & Co., 103 North St., Danbury. Noted Dec. 5, C. D.—Dec. 12, E. N.-R., under "Contracts Awarded."

Conn., Hartford—PLANT—Fuller Brush Co., Main St., plant addition, Main St., to R. G. Bent Co., 93 Edwards St., Hartford. Est. $65,000.

Ill., Sterling — PLANT — Northwest Barbed Wire Co., Sterling, about 500 tons structural steel for plant addition, to J. T. Ryerson & Sons, 2558 West 16th St., Chicago; all separate contracts awarded. Est. exceeds $200,000. Noted Apr. 19, C. D.—Apr. 25, E. N.-R.

Mass., Cambridge—WAREHOUSE—Dewey & Almy Chemical Co., 235 Harvey St., 1 story, 72x112 ft., steel and corrugated asbestos warehouse addition, to L. C. Blake Constr. Co., 50 Dyer Ave., Milton. Est. exceeds $28,500. Private plans.

Mass., Chicopee—PLANT—Hampden Brewing Co., North Chicopee, 3 story, basement, 60x133 ft., brick, steel plant addition, concrete found., to Daniel O'Connell's Sons, Inc., 480 Hampden St., Holyoke, to exceed $40,000. Bids Nov. 25, awarded about Dec. 4. Noted Nov. 22, C. D.

N. J., Newark—STOCK HOUSE—P. Ballantine & Sons, 57 Freeman St., stock house alteration for Brewing Co. on Ferry St., to Turner Constr. Co., 420 Lexington Ave., New York, $108,800. Awarded Dec. 5. V. H. Strombach, 1243 Springfield Ave., Irvington, archt.

N. Y., Corning—FACTORY—Corning Glass Wks., J. Romig, genl. mgr. Fibre Products Div., Corning, 80x240 ft. factory for manufacture of glass wool, also 36x48 ft. boiler house on East Tioga St., own forces under supervision A. Vaksdal, c/o owner, engr.

N. Y., Niagara Falls—WAREHOUSE—Wright & Kremers, Inc., general contractors, Main and Pine Aves., structural steel for altering and constructing additions to warehouse for Defiance Paper Co., Walnut Ave. and 3rd St., to Dobbie Fdry. & Machine Co., Portage Rd.

★ **N. Y., Richmond Hill**—DAIRY, etc.—Sheffield Farms, 524 West 57th St., New York, general contract dairy and distribution plant, 132nd St. and 94th Ave., to White Constr. Co., 95 Madison Ave., New York. Est. $1,000,000. Separate contracts now being awarded.

O., Lakewood—BOILER and LAUNDRY—City, brick, steel boiler and laundry, to H. F. Juergens, 15430 Edgewater Dr., $41,000; heating, incl. one 50 hp. and one 75 hp. boilers with stokers, to Maurer Bros., 8600 Detroit Ave., Cleveland, $25,000. P.W.A. Awarded Dec. 10. B. R. Kimberly, City Hall, engr.

Tex., Dallas — PLANT — Globe Union Mfg. Co., East Keefe Ave., Milwaukee, Wis., plant, to Henger Constr. Co., Dallas Bank & Trust Bldg. Est. $85,000 with equipment.

★ **W. Va., Logan**—POWER PLANT—Appalachian Electric Power Co., c/o American Gas & Electric Co., 30 Church St., New York, constructing steam-electric power plant, separate contracts: electric generating equipment, to General Electric Co., River Rd., Schenectady, N. Y. Est. $3,500,000.

Wis., Racine—FACTORY—Hamilton Mfg. Co., Racine, general contract 3 story, 83x151 ft. factory building, to Nelson & Co., Racine. Noted Dec. 9, C. D.—Dec. 12, E. N.-R.

†*Federal Government.*

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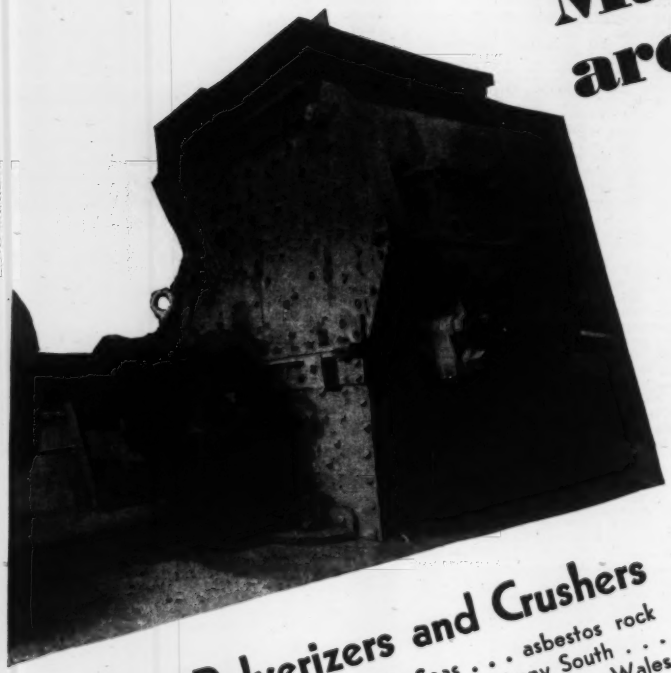

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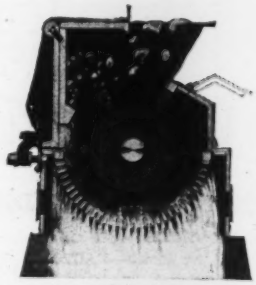

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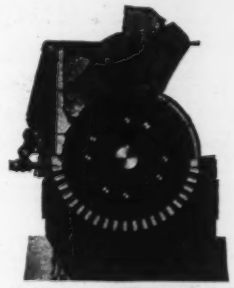
Material is held in suspension above the rotor until reduced to approximately the size desired before passing over the screen bars. A ledge on the breaker plate retains the material above rotor, yet material is free to move, thereby eliminating undue load or shock. This method of reduction is protected fully by patents. Write for data.



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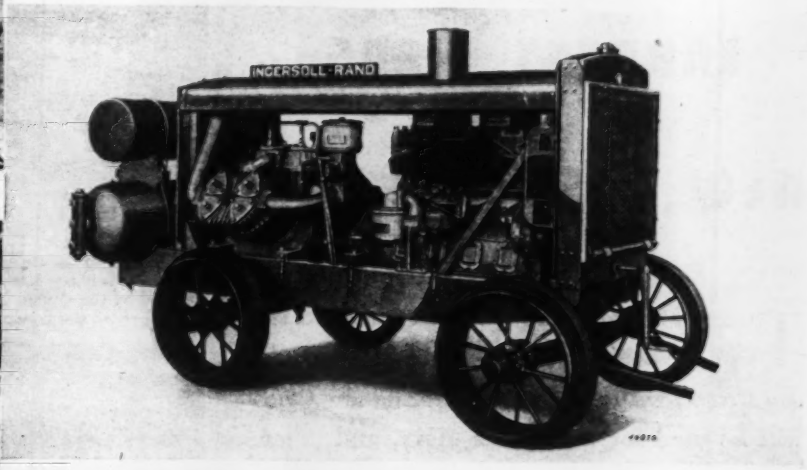

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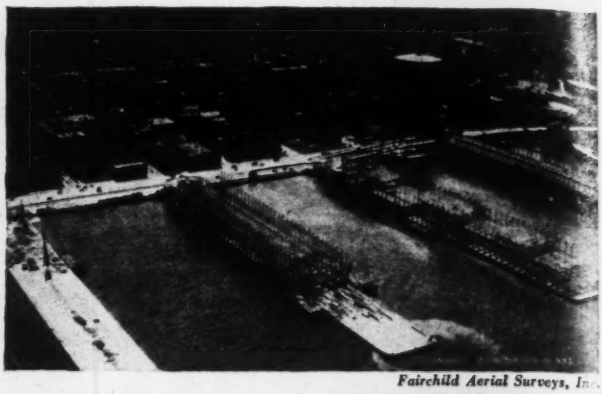
The 3
LARGEST PIERS IN NEW YORK HARBOR

THESE three piers, 1100 ft. long and 125 ft. wide, provide accommodation in the Hudson River for the super-liner Normandie, and will be used for the Queen Mary, and other great vessels that may follow. They are the largest piers in New York Harbor. Steel for their superstructures was furnished and erected by McClintic-Marshall.

General Contractors, Pier 88, Wm. Kennedy Construction Company, Inc.; Piers 90 and 92, Geo. F. Driscoll Company.

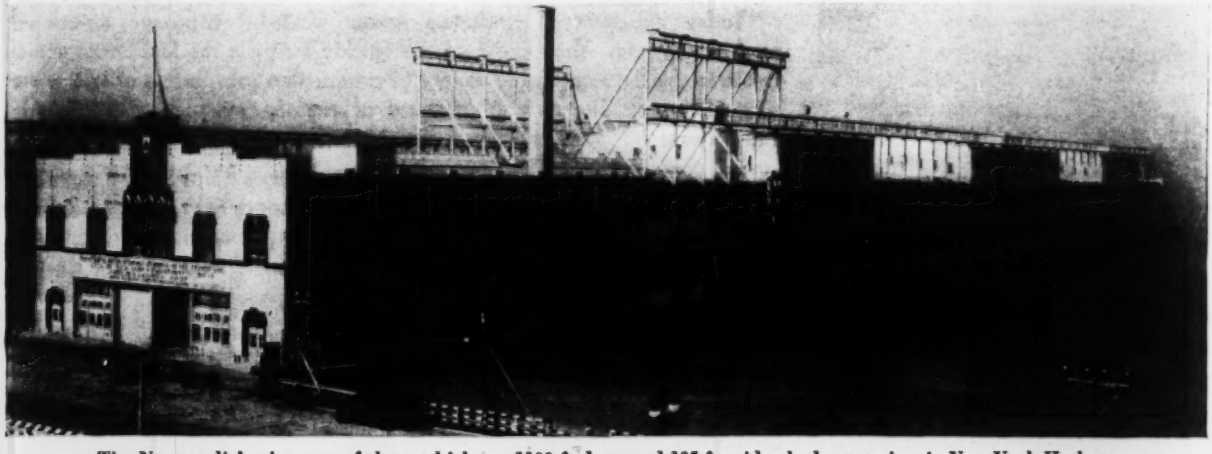


Fairchild Aerial Surveys, Inc.

An air view of the three piers as they looked shortly after the start of steel erection by McClintic-Marshall. The pier in the center will be used by the Queen Mary, great Cunard-White Star liner; the pier in the foreground by ships of the Italian Line.

McLaughlin Aerial Survey from Wide World.

The Normandie, resting at Pier 88 in New York Harbor after her record-breaking maiden voyage. Steelwork of Pier 90 can be seen at left.



The Normandie's pier, one of three which are 1100 ft. long and 125 ft. wide, the largest piers in New York Harbor.

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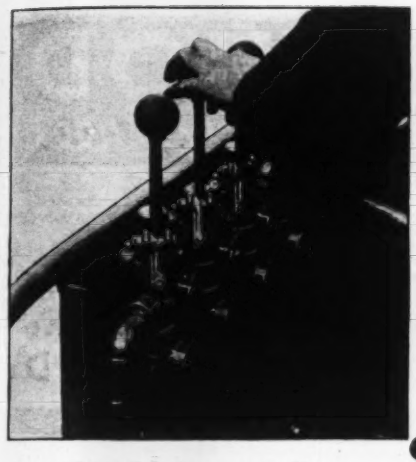

This is all it takes to raise and lower, or side shift the blade, steer, lean the wheels, reverse the circle, or shift the frame on the rear axle. Almost effortless but always accurate.

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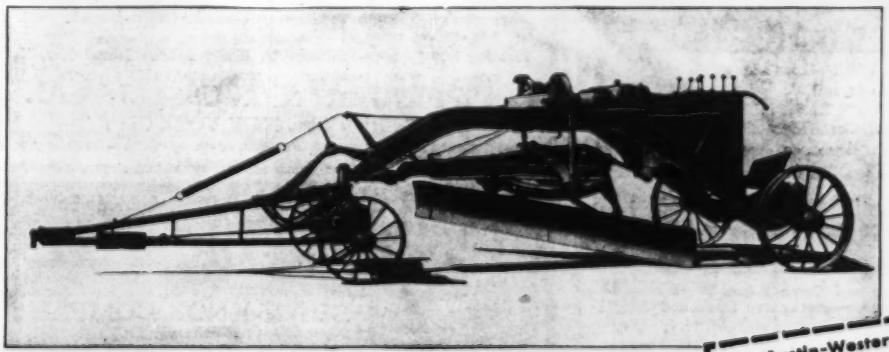
Write for complete information on this or any other machine listed below, or use the coupon.



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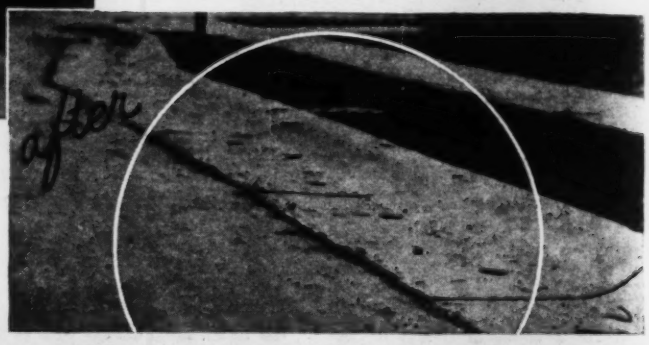

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Smith Tapping Valves are made with the openings through their seat-rings 3/16" larger than standard and with their ends bored concentric with those rings, so as to provide perfect alignment of the tapping machine shaft and its cutter.

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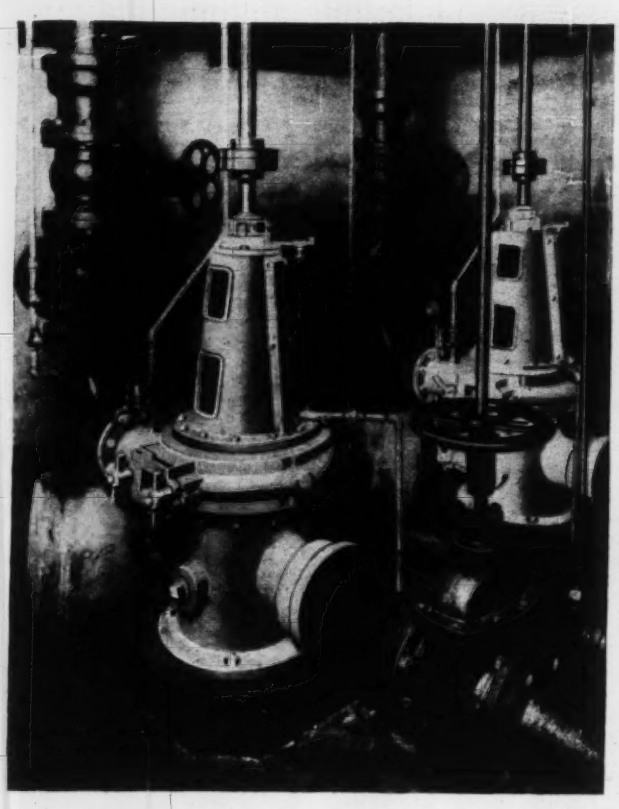

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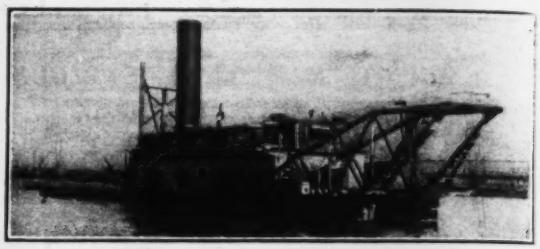

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It has 14% greater carrying capacity. Does not scale or pit. Resists Frost and Electrolysis. Is lighter and more easily installed. Sizes 1" and up—Length maximum 12 ft. Pressures to 172 lbs. Used for supply lines, Penstocks, sewage, chemical lines, mines, fisheries and fume stacks.

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OFFICIAL PROPOSALS

Bids: January, 8, 1936.

Water Supply System

Borough of Andover, New Jersey.

Sealed proposals will be received by the Mayor and Council of the Borough of Andover, at the Borough Hall, Borough of Andover, Sussex County, New Jersey, at eight o'clock P. M. Eastern Standard Time, on Wednesday, January 8th, 1936, for the construction of a Water Supply System for the Borough of Andover, Sussex County, New Jersey, together with the incidental work in connection therewith.

Separate proposals will be taken on the six major divisions of the work as follows: (1) Furnishing Pipe and Fittings. (2) Installing Pipe Lines and Fittings. (3) Furnishing and installing Pumps. (4) Erecting Pump House. (5) Furnishing and Installing Steel Storage Tank. (6) Drilling Well.

Prospective bidders will be requested to qualify as to ability, organization and experience before receiving plans and specifications.

Instructions to Bidders, Construction Regulations, Form of Proposal, Plans and Specifications and other contract documents, may be examined at the office of the Engineer, Hugh A. Kelly, 921 Bergen Avenue, Jersey City, N. J., and/or at the office of the Borough Clerk, Borough Hall, Borough of Andover, Sussex County, New Jersey, and one copy thereof may be obtained by each bidder upon deposit of the sum of Twenty-five Dollars ($25.00) for each set of plans. The deposit will be refunded to the bidder upon the return of the documents in good condition within thirty days afer the opening of bids, provided that a formal proposal has been submitted by the bidder.

Proposals shall be enclosed in opaque sealed envelopes, addressed to the Clerk of the Borough of Andover, Sussex County, New Jersey, and plainly marked on the outside "Proposal for....." and title of work covered thereby (Furnishing Pipe and Fittings, Installing Pipe Lines and Fittings, Furnishing and Installing Pumps, Erecting Pump House, Furnishing and Installing Steel Storage Tank or Drilling Well) and the name of the bidder.

Each bid must be accompanied by a certified check for five (5%) per centum of the amount of the bid, drawn upon an incorporated Bank or Trust Company, payable to the order of the Treasurer, Borough of Andover, as a guarantee that in case the contract is awarded to the bidder he will, within two weeks thereafter execute such contract and furnish satisfactory performance bond. Upon failure so to do he shall forfeit the deposit as liquidated damages and the acceptance of the bid will be contingent upon the fulfillment of this requirement by the bidder. The checks of all excepting the three lowest bidders will be returned within five days after the opening of bids, and the remaining checks will be returned when the State Director P.W.A. has approved the executed contract. No interest shall be allowed upon any such certified check.

The successful bidder will be required to furnish a performance bond in approved form and with sureties satisfactory to the Mayor and Council and approved by the State Director P.W.A., which bond shall be in the amount of the contract.

The project is financed in whole or in part by the Federal Emergency Administration of Public Works and is subject to all its requirements.

All contracts and subcontracts are subject to the approval of the Government Engineer.

The Mayor and Council reserves the right to reject any or all bids and/or accept the bid that in its judgment will be for the best interests of the Borough of Andover, subject to the approval of the State Director P.W.A.

Attention of prospective bidders is further direced to Paragraph 2-C of P.W.A. Construction Regulations included in the specifications. The office of the National Re-Employment Service which may be called upon for lists of qualified workers is at Municipal Building, Franklin, N. J., Leroy Walsh, Manager.

MAYOR AND COUNCIL OF THE BOROUGH OF ANDOVER, N. J.

YOU GET national competition on your request for bids in the Official Proposal Columns of ENGINEERING NEWS-RECORD

OFFICIAL PROPOSALS

Bids: January 2, 1936.

Transportation of Sewage Sludge

ESSEX AND UNION COUNTIES, NEW JERSEY

Joint Meeting for certain Municipalities in Essex and Union Counties, New Jersey.

Sealed proposals for furnishing, maintaining and operating barge and towing service for the transportation of Sewage Sludge from the Joint Meeting Sewage Treatment Plant, Elizabeth, New Jersey.

Notice is hereby given that sealed alternate proposals for furnishing, maintaining and operating one or more barges and towing service for the transportation of Sewage Sludge from a private wharf on Arthur Kill in the City of Elizabeth, New Jersey, to a point at sea for a period of one or four years will be received by the Joint Meeting for certain Municipalities in Essex and Union Counties, New Jersey.

Said proposals will be received in the Council Chamber, City Hall, East Orange, New Jersey, at 3 P.M. on Thursday, January 2nd, 1936, at which time they will be publicly opened and read. Information concerning this work, blank forms of questionaire and proposal forms may be obtained from the office of the Secretary of the Joint Meeting, Room 311, City Hall, Newark, New Jersey.

By order of the Joint Meeting,
Peter A. Smith, Chairman.
EDWARD S. RANKIN, Secretary

U. S. Government

WAR DEPARTMENT: United States Engineer Office, Galveston, Texas. Sealed bids will be received until 2:00 P.M., January 22, 1936, and then publicly opened, for furnishing all labor and materials and *performing all work for repairing the South West Jetty at Freeport, Texas*, by preparing a bed and placing thereon a concrete cap containing about 4600 cubic yards and extending from Station 0 to about Station 46 00. Further information on application. (265)

Continued on Page 44

OFFICIAL PROPOSALS

Continued from page 43

Bids: January 9, 1936.

RE-ADVERTISEMENT

Furnishing and Delivering Steam Turbine Driven Generator Units—Division "I" Condensing Equipment for Steam Turbine Driven Generator Units —Division "J" Feedwater Heating Equipment —Division "K" Power Transformers— Division "L"

THE SANITARY DISTRICT OF CHICAGO
SOUTHWEST SEWAGE TREATMENT WORKS

Sealed proposals, endorsed, "PROPOSALS FOR SOUTHWEST SEWAGE TREATMENT WORKS, DIVISIONS I, J, K and L," will be received by the Clerk of The Sanitary District of Chicago, at the office of said Sanitary District, Room 600, 910 South Michigan Avenue, Chicago, Illinois, until 1:30 P.M. Central Standard Time, on Thursday, January 9, 1936, and will be opened publicly by the Board of Trustees of said Sanitary District at a meeting to be held on that day or at the first meeting thereafter.

The work for which tenders are invited includes the following Divisions for furnishing and delivering of equipment as specified, f.o.b. cars, at the Southwest Sewage Treatment Works in the Village of Stickney, Cook County, Illinois:

DIVISION "I"
STEAM TURBINE DRIVEN GENERATOR UNITS

This includes furnishing and delivering two (2) Steam Turbine Driven Generator Units, each with a rated capacity of 5000 K.V.A. at 80 per cent power factor, complete with auxiliary equipment, appurtenances and accessories.

DIVISION "J"
CONDENSING EQUIPMENT FOR STEAM TURBINE DRIVEN GENERATOR UNITS

This includes furnishing and delivering two (2) units of steam condensing equipment, each unit including a condenser having not less than 5500 square feet of effective surface, complete with auxiliary equipment, appurtenances and accessories.

DIVISION "K"
FEEDWATER HEATING EQUIPMENT

This includes furnishing and delivering nine (9) low pressure heaters, one (1) deaerating heater, one (1) double effect evaporator with feed deaerating type heater, and evaporator condenser, complete with auxiliary equipment, appurtenances and accessories.

DIVISION "L"
POWER TRANSFORMERS

This includes furnishing and delivering six (6) 1667 K.V.A., 60 cycles, single phase, oil insulated, self-cooled, outdoor, power transformers, complete with appurtenances.

The site of the Southwest Sewage Treatment Works is situated immediately west of the Sanitary District's West Side Sewage Treatment Works, located west of 52nd Avenue, south of West Pershing Road and north of the right of way of the Chicago and Illinois Western Railroad in the Village of Stickney, Cook County, Illinois.

Proposals may be made on one division or all divisions, complete, but not on any part of one division.

All bids must be made on blank forms of proposals furnished by the Sanitary District, and shall be made in accordance with and conform to all of the terms and conditions set forth in "Requirements for Bidding and Instructions to Bidders" attached thereto.

Specifications, forms of proposals and general plans may be obtained at the office of said Sanitary District upon deposit of Ten Dollars ($10.00), which sum so deposited will be refunded if said plans and specifications are returned in good condition within thirty (30) days following the opening of the bids.

Each proposal must be accompanied by cash or a cashier's check or a certified check on a responsible bank doing business in the City of Chicago, to the amount or amounts as follows:

Division "I"—Steam Turbine Driven Generator Units—Ten Thousand Dollars ($10,000.00).

Division "J"—Condensing Equipment for Steam Turbine Driven Generator Units — Five Thousand Dollars ($5,000.00).

Division "K"—Feedwater Heating Equipment—Three Thousand Five Hundred Dollars ($3500.00).

DIVISION "L"—Power Transformers—Two Thousand Five Hundred Dollars ($2500.00).

All cashier's checks or certified checks shall be made payable to the order of the Clerk of The Sanitary District of Chicago.

This work is under the supervision of the Federal Emergency Administration of Public Works and all provisions of Bulletin No. 2 (Revised March, 1935), must be strictly complied with, including minimum hourly wage rates for skilled and unskilled labor prescribed by the Administrator for the zone or zones in which the work is to be done, excepting therefrom any provisions relating to N.R.A., viz.:

Northern Zone:
Skilled labor $1.20
Unskilled labor ..... .50
Southern Zone:
Skilled labor $1.00
Unskilled labor ..... .40
Central Zone:
Skilled labor $1.10
Unskilled labor ..... .45

The Board of Trustees of The Sanitary District of Chicago reserves the right to reject any or all proposals.

THE SANITARY DISTRICT OF CHICAGO,
By ROSS A. WOODHULL,
Chairman of Its Committee on Finance.

ATTEST:
JAMES J. SULLIVAN,
Clerk.
Chicago, December 23, 1935.

Bids January 14, 1936.

Sewer Construction

Louisville, Ky.

Sealed proposals will be received by the Commissioners of Sewerage of Louisville until 12 o'clock, noon, January 14, 1936, for constructing LARCHMONT AVE. SEWER, E. R. A. Project No. 19, Contract No. 90, embracing the following:

1,692 lin.ft.—45" Reinforced Concrete Circular Sewer.

Bids will be received and contract, if let, shall be subject to all provisions of the Emergency Relief Appropriation Act of 1935. Attention is called to the fact that not less than the minimum rates as prescribed in the Construction Regulations must be paid on this Project.

The award of this contract is contingent upon the approval of the State Director, P.W.A., and the securing of funds from the Government. No bidder may withdraw his bid for a period of thirty (30) days after the date set for the opening thereof. After the tabulation of bids has been made and the lowest acceptable bidder determined and approved, all other certified bid checks will be returned.

The award of this contract is contingent upon the securing of an acceptable bid which will fall within the amount of funds available for the construction of the project.

Commissioners of Sewerage of Louisville reserve the right to make such changes in the design and the extent of the works as may be necessary to reduce the cost of the project to within the limit of the funds available; provided such reduction does not affect the total estimate more than 20 per cent.

Information for Bidders, Proposal, Contract, Specifications and Bonds, bound in one volume and Drawings may be had upon deposit of Ten Dollars ($10) to be refunded upon their return within thirty (30) days after the opening of bids.

Each proposal made upon the blank form of "Proposal" must be inclosed in a sealed envelope addressed to the COMMISSIONERS OF SEWERAGE OF LOUISVILLE, 400 MARION E. TAYLOR BLDG., FOURTH AND JEFFERSON STREETS, LOUISVILLE, KY., and accompanied by a certified check or cashier's check drawn upon a state or national bank or trust company established in the City of Louisville (or the City of New York) or by New York Exchange, said check or exchange to be for an amount not less than ten (10) per cent of the total amount of the accompanying bid. Check or exchange not to be inclosed in envelope containing bid.

The right to accept any bid or reject any and all bids is reserved.

COMMISSIONERS OF SEWERAGE OF LOUISVILLE.
By J. H. DURHAM,
Chairman.

WOOLSEY M. CAYE,
Technical Engineer.

Bids: January 6, 1936.

READVERTISEMENT

State Highway Work

STATE OF NEW JERSEY
STATE HIGHWAY DEARTMENT
TRENTON

NOTICE IS HEREBY GIVEN that sealed bids will be received by the State Highway Commissioner for:

ROUTE 34, SECTION 5

Construction of Route 34, Section 5, from Route No. 35 to New Bedford Road, Monmouth County, length 3.349 miles.

Estimated:
163,921 cu.yds. roadway excavation unclassified
3,780 cu.yds. wet excavation
1,400 sq.yds. removal of rein.conc. pavement
68,476 sq.yds. 9" rein.conc. pavement
4,781 sq.yds. 9" plain conc. pavement
534 sq.yds. 18" rein.conc. bridge approach slab
1,683 cu.yds. concrete in bridges
46,050 lbs. reinforcement steel in bridges
175,800 lbs. structural steel in bridges

Bids for the above will be received at the office of the State Highway Department, State House Annex, Trenton, N. J., on Monday, January 6, 1936, at twelve o'clock Noon, Eastern Standard Time, and will be opened and read immediately thereafter.

The receipt and opening of bids is subject to the proper qualification of the bidder in accordance with the provisions of the prequalification law and the regulations adopted by the State Highway Commissioner. Bidders must submit a revised financial statement and statement of plan and equipment with their bid.

NOTE: The proposed work is a "Regular Federal Aid Project" under the provisions of Section 4 of the Federal Act of June 18, 1934 (H.R. 8781) known as the Hayden-Cartwright Act, and is to be performed in accordance with the Special Provisions and Requirements of the United States Department of Agriculture, Bureau of Public Roads, as outlined in the Supplementary Specifications to be made a part of the contract and specifications, which provisions require that labor be employed from lists furnished by the National Re-employment Service, 1st Avenue and Board Walk, Asbury Park, N. J. The attention of bidders is directed to the Special Provisions covering subletting or asigning the contract and to the use of Domestic Materials. The minimum wage paid to all skilled labor employed on this contract shall be $1.20 per hour. The minimum wage paid to all intermediate grade of labor employed on this contract shall be 65c per hour. The minimum wage paid to all unskilled labor employed on this contract shall be 50c per hour.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file in the office of the State Highway Department, Trenton, N. J., and may be inspected by Prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) for each set of plans upon application to A. Lee Grover, Chief Clerk, State Highway Department, Room 102, State House Annex, Trenton, N. J. Bids must be made on the standard proposal forms in the manner designated in the standard State Highway specifications and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten percent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal form and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened. The right is reserved to reject any or all bids.

Signed: E. DONALD STERNER,
State Highway Commissioner.

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OFFICIAL PROPOSALS

Bids: December 31.

State Highway Work

STATE DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
ALBANY, N. Y.

Sealed proposals will be received by the undersigned at the State Office Building, 13th Floor, Albany, N. Y., until one o'clock p.m. on Tuesday, December 31, 1935, for the construction and reconstruction of highways and bridges in the following counties in accordance with the rules and regulations for carrying out the provisions of the Emergency Relief Appropriation Act of 1935 (Public Resolution No. 11-74th Congress).

Construction:

County	Deposit Required
BRONX ..... (Var. Opt. Colored Concrete 8" or 9". Var. M.M. 3 Stone Faced Rigid Frame two 36' 11½" spans: 0.28 mile.)	$16,500
BROOME ..... (80' Plate Girder.)	800
(Var. Conc. 8"; various structures carrying Erie and D.L.& W. R.R.'s over a number of Streets: 0.25 mile.)	41,000
CHENANGO ..... (Timber Trestle, 3 spans, Lgth. 40' 3"; Timber Trestle 3 spans, Lgth. 52' 3"; 23½' Slab; Timber Trestle, 3 spans, Lgth. 40' 3"; Timber Trestle, 4 spans, Lgth. 70'; 15' x 11' Box; 12' x 4' Box; 5' x 4' Box; 12' x 4' Box.)	2,700
SENECA ..... (40'-50'-45'-50'-I-beams; Timber Trestles 51', 56' 51'; three 20' slabs.)	4,500
TOMPKINS ..... (Timber Trestle, 6 spans, Lgth. 102½'; Timber Trestle, 3 spans, Lgth. 45½'; Open Box 18' x 17½'; Closed Box 20' x 6'; Closed Box 18' x 7' 8".)	2,300
Reconstruction:	
MONROE ..... (40' M.M. 3 Multiple span I-beam, total length 222' over Penn. R.R.: 0.39 mile.)	13,000
Roadside Improvement)	800
ORANGE ..... (30' 40' concrete 8" and 73' Girder carrying Erie R.R.: 0.43 mile.)	9,500
ROCKLAND ..... (40' Concrete 8" and 8 span steel Beam structure over Erie R.R.: 0.57 mile.)	10,700

Maps, plans, specifications, and estimates may be seen and proposal forms obtained at the office of the Division of Highways in Albany, N. Y., and at the office of the District Engineers in whose districts the roads are located, upon the payment of Five Dollars ($5.00) for plans and proposal forms. Standard specifications are Two Dollars ($2.00) per copy. Plans and proposal forms may also be seen at the office of the State Department of Public Works, State Office Bldg., Worth & Center Streets, New York City. No refund will be made on plans, specifications, or proposal forms. The addresses of the District Engineers and Counties in each district will be furnished upon request.

Special attention of bidders is called to "General Information for Bidders" in the proposal, specifications, and contract agreement. The attention of bidders is also directed to the special provisions covering sub-letting or assigning the contract and to the use of domestic materials, when let under the rules and regulations for carrying out the provisions of the Emergency Relief Appropriation Act of 1935 (Public Resolution No. 11-74th Congress) for the purpose of providing employment and hastening industrial recovery.

Proposal for each highway or contract must be submitted in a separate sealed envelope with the name and number of the highway plainly endorsed on the outside of the envelope. Each proposal must be accompanied by cash, draft or certified check, payable to the order of the New York State Department of Public Works, Division of Highways, for the sum as specified in the advertisement for proposals and the proposal itself for each project. The retention and disposal of such cash, draft or check by the State Division of Highways shall conform with Subdivision 2 of Section 130 of the Highway Law, as amended. The successful bidder will be required to execute the contract and comply in all respects with Sec. 130 of the Highway Law, as amended. The amount of the certified check accompanying the proposal of the bidder to whom the contract is awarded will be returned when ten per centum of the work under the contract has been completed. If Surety Bond is dispensed with, in pursuance to the Highway Law, the amount of the bidding check will be returned when fifteen percentum of the contract work has been completed.

On contracts with federal funds, when optional types are permitted for any one item of work, contractors must state in the space provided in the proposal for this purpose the exact designation of the optional type upon which the proposal is predicated. No one proposal shall contain more than one bid for an optional item. The award, if made, will be on the basis of the responsible proposal which for all items of work gives the lowest total cost for the project and the contract will call for the type designated in such proposal.

Skilled, Intermediate Grade, and Unskilled Labor on all projects shall receive the minimum wage rate per hour as follows:

In New York City: Skilled Labor, eighty cents per hour; Intermediate Grade Labor, sixty-five cents per hour; Unskilled Labor, fifty-five cents per hour; in the Counties of Nassau, Rockland, Suffolk and Westchester: Skilled Labor, seventy-five cents per hour; Intermediate Grade Labor, sixty cents per hour; Unskilled Labor, fifty-five cents per hour; in the Counties of Dutchess, Orange, Putnam, Ulster & Sullivan, seventy-five cents per hour for Skilled Labor; Intermediate Grade Labor, fifty-five cents per hour; Unskilled Labor, fifty cents per hour; and in all other counties other than above, Skilled Labor, seventy-five cents per hour; Intermediate Grade Labor, fifty-five cents per hour; Unskilled Labor, forty-five cents per hour.

The minimum hourly rate of wages for the various types of operations and trades, as well as the hours of work and conditions of employment, shall be set forth under the Special Provisions in the itemized proposal for each project.

In conformity with the provisions of Section 220, Sub-division d, of the State Labor Law, as amended, the minimum hourly rate of wages has been established and is annexed to and forms a part of the specifications for the project, and may be ascertained upon reference to the proposal for the project itself.

The right is reserved to reject any or all bids.

FRED'K STUART GREENE,
Supt. State Dept. Public Works.

Bids: January 10, 1936.

Reconstruction of Bridge

TRANSIT COMMISSION
STATE OF NEW YORK

(Metropolitan Division—Department of Public Service)—270 MADISON AVENUE, NEW YORK CITY—FOR RECONSTRUCTION OF BRIDGE CARRYING TRACKS OF THE STATEN ISLAND RAPID TRANSIT RAILWAY COMPANY ACROSS ST. JOHN'S AVENUE AND RELATED STRUCTURES, FORT WADSWORTH, STATEN ISLAND, N. Y.—Pursuant to the Provisions of Chapter 481 Laws of 1910, Chapter 936, Laws of 1935, and amendments thereto, and under the rules and regulations for carrying out the provisions of the Emergency Relief Appropriation Act of 1935 (Public Resolution No. 11—74th Congress), under which Act this project will be financed in whole or in part, sealed proposals will be received by the Transit Commission at the office of the Commission, 10th Floor, 270 Madison Avenue, New York, New York, until Two o'clock P.M. on January 10th, 1936, at which time and place they will be publicly opened and read, for the reconstruction of bridge carrying the tracks of The Staten Island Rapid Transit Railway Company across St. Johns Avenue, together with related structures. Maps, plans, specifications and proposal forms may be obtained at the office of the Transit Commission, 270 Madison Avenue, New York, New York, upon the payment of Ten Dollars ($10.00) for the plans and proposal forms. Standard specifications are Two Dollars ($2.00) per copy. No refund will be made on plans, proposal forms or specifications. Plans and proposal forms may also be seen at the office of the State Department of Public Works, State Office Building, Albany, New York.

The proposal must be submitted in a separate sealed envelope with the name of the project plainly indicated on the outside of the envelope. Each proposal must be accompanied by cash, draft or certified check, payable to the order of the Transit Commission, State of New York, for the sum of Three Thousand Dollars ($3,000). Such deposit must not be enclosed in the envelope containing the proposal. The retention and disposal of such cash, draft or check by the Transit Commission shall conform with the procedure specified in Subdivision 2 of Section 130 of the Highway Law, as amended. The amount of the certified check accompanying the proposal of the bidder to whom the contract is awarded will be returned when 10% of the work under the contract has been completed.

Federal Special Provisions require that the minimum wages to be paid on this project shall be as follows:

Skilled Labor, eighty cents per hour; Intermediate Grade Labor, sixty-five cents per hour; Unskilled Labor, fifty-five cents per hour.

In conformity with the provisions of Articles 8 and 8A of the State Labor Law, the minimum hourly rate of wages has been established and is annexed to and forms a part of the Special Specifications for the project and may be ascertained by reference thereto.

The right is reserved to reject any or all bids.

TRANSIT COMMISSION
STATE OF NEW YORK
WILLIAM G. FULLEN, Chairman
LEON C. GODLEY, Commissioner
REUBEN L. HASKELL, Commissioner
MACK NOMBURG, Secretary

U. S. Government

PROCUREMENT DIVISION, Public Works Branch, Washington, D. C., Dec. 13, 1935.—Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., Jan. 6, 1936, for furnishing all labor and materials and performing all work for the *construction of the U.S.C.G., Air Station at Miami, Fla.* Attention is directed to the special conditions of bidding set forth in the specification. Upon application, one set of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawthis office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $10 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer of the U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. REYNOLDS, Assistant Director of Procurement, Public Works Branch. (258)

OFFICIAL PROPOSALS

Bids: January 7, 1936.

State Highway Work

STATE DEPARTMENT OF PUBLIC WORKS

DIVISION OF HIGHWAYS
ALBANY, N. Y.

Sealed proposals will be received by the undersigned at the State Office Building, 13th Floor, Albany, N. Y., until one o'clock p.m. on Tuesday, January 7, 1936, for the construction and reconstruction of highways and bridges in the following counties, in accordance with the rules and regulations for carrying out the provisions of the Emergency Relief Appropriation Act of 1935 (Public Resolution No. 11-74th Congress).

Construction:

County	Type	Miles	Deposit Required
CHENANGO	(Tim. Trestle, 4 spans, tot. lgth. 58' Tim. Trestle, 4 spans, tot. lgth. 62' 2-12' slabs)		$1,100
GREENE	140' Truss; BMP. Type Appr. 0.27 mile.)		3,500
WESTCHESTER	(44' Concrete 8"; 0.22 mile)		2,900
Reconstruction:			
CORTLAND	(30' I-Beam; 10'x9' Box; 21' slab; 45' I-Beam; M.M. 3 Appr.; 0.46 mile)		3,200
ERIE	(Concrete 1.06 mile)		3,000
ONONDAGA	(Roadside Improvement)		700
RENSSELAER	(20' Concrete 8-7-8; 0.22 mile)		3,400
SCHUYLER	(50' I-Beam; 42' I-Beam; Concrete Appr. 0.23 mile)		3,000
TOMPKINS	(22' Rigid Frame; MM 3 Appr. 0.12 mile)		1,300
WESTCHESTER	(Concrete—Var. MM. 4, inc. 3 span, R.C. Beam sep. structure totaling 130'; 1.36 mile)		9,500

Maps, plans, specifications, and estimates may be seen and proposal forms obtained at the office of the Division of Highways in Albany, N. Y., and at the office of the District Engineers in whose district the roads are located, upon the payment of Five Dollars ($5.00) for plans and proposal forms. Standard specifications are Two Dollars ($2.00) per copy. Plans and proposal forms may also be seen at the office of the State Department of Public Works, State Office Bldg., Worth & Center Streets, New York City. The addresses of the District Engineers and Counties in each district will be furnished upon request. No refund will be made on plans, specifications, or proposal forms.

Special attention of bidders is called to "General Information for Bidders" in the proposal, specifications, and contract agreement. The attention of bidders is also directed to the special provisions covering sub-letting or assigning the contract and to the use of domestic materials, when let under the rules and regulations for carrying out the provisions of the Emergency Relief Appropriation Act of 1935 (Public Resolution No. 11-74th Congress) for the purpose of providing employment and hastening industrial recovery.

Proposal for each highway or contract must be submitted in a separate sealed envelope with the name and number of the highway plainly endorsed on the outside of the envelope. Each proposal must be accompanied by cash, draft or certified check, payable to the order of the New York State Department of Public Works, Division of Highways, for the sum as specified in the advertisement for proposals and the proposal itself for each project. The retention and disposal of such cash, draft or check by the State Division of Highways shall conform with Subdivision 2 of Section 130 of the Highway Law, as amended. The successful bidder will be required to execute the contract and comply in all respects with Sec. 130 of the Highway Law, as amended. The amount of the certified check accompanying the proposal of the bidder to whom the contract is awarded will be returned when ten percentum of the work under the contract has been completed. If Surety Bond is dispensed with, in pursuance to the Highway Law, the amount of the bidding check will be returned when fifteen percentum of the contract work has been completed.

On contracts with federal funds, when optional types are permitted for any one item of work, contractors must state in the space provided in the proposal for this purpose the exact designation of the optional type upon which the proposal is predicated. No one proposal shall contain more than one bid for an optional item. The award, if made, will be on the basis of the responsible proposal which for all items of work gives the lowest total cost for the project and the contract will call for the type designated in such proposal.

Skilled, Intermediate Grade, and Unskilled Labor on all projects shall receive the minimum wage rate per hour as follows:

In New York City: Skilled Labor, eighty cents per hour; Intermediate Grade Labor, sixty-five cents per hour; Unskilled Labor, fifty-five cents per hour; in the Counties of Nassau, Rockland, Suffolk and Westchester;—Skilled Labor, seventy-five cents per hour; Intermediate Grade Labor, sixty cents per hour; Unskilled Labor, fifty-five cents per hour; in the Counties of Dutchess, Orange, Putnam, Ulster & Sullivan, seventy-five cents per hour for Skilled Labor; Intermediate Grade Labor, Fifty-five cents per hour; Unskilled Labor, fifty cents per hour; and in all other counties other than above, Skilled Labor, seventy-five cents per hour; Intermediate Grade Labor, fifty-five cents per hour; Unskilled Labor, Forty-five cents per hour.

The minimum hourly rate of wages for the various types of operations and trades, as well as the hours of work and conditions of employment, shall be set forth under the Special Provisions in the itemized proposal for each project.

In conformity with the provisions of Section 220, Sub-division d, of the State Labor Law, as amended, the minimum hourly rate of wages has been established and is annexed to and forms a part of the specifications for the project, and may be ascertained upon reference to the proposal for the project itself.

The right is reserved to reject any or all bids.

FRED'K STUART GREENE,
Supt. State Dept. Public Works.

Bids: January 6, 1936

READVERTISEMENT

State Highway Work

STATE OF NEW JERSEY
STATE HIGHWAY DEPARTMENT
TRENTON

NOTICE IS HEREBY GIVEN that sealed bids will be received by the State Highway Commissioner for:

ROUTE 25, SECTION 24

Construction of Route 25, Section 24, from Burlington to Crystal Lake, Burlington County, length 5.911 miles.

Estimated:

102,859 cu.yds. roadway excavation unclassified
16,161 cu.yds. borrow excavation
2,490 cu.yds. wet excavation
65,031 sq.yds. removal existing conc. pavement
151,946 sq.yds. 9" rein.conc. pavement
2,180 sq.yds. 9" plain conc. pavement
1,824 cu.yds. concrete in bridges
56,650 lbs. reinforcement steel in bridges
1,425 lbs. structural steel in bridges

Bids for the above will be received at the office of the State Highway Department, State House Annex, Trenton, N. J., on Monday, January 6, 1936, at twelve o'clock Noon, Eastern Standard Time, and will be opened and read immediately thereafter.

The receipt and opening of bids is subject to the proper qualification of the bidder in accordance with the provisions of the prequalification law and the regulations adopted by the State Highway Commissioner. Bidders must submit a revised financial statement and statement of plan and equipment with their bid.

NOTE: The proposed work is a "Regular Federal Aid Project" under the provisions of Section 4 of the Federal Act of June 18, 1934 (H.R. 8781) known as the Hayden-Cartwright Act, and is to be performed in accordance with the Special Provisions and Requirements of the United States Department of Agriculture, Bureau of Public Roads, as outlined in the Supplementary Specifications to be made a part of the contract and specifications, which provisions require that labor be employed from lists furnished by the National Re-employment Service, 55 Main Street, Mt. Holly, N. J. The attention of bidders is directed to the Special Provisions covering subletting or assigning the contract and to the use of Domestic Materials. The minimum wage paid to all skilled labor employed on this contract shall be $1.20 per hour. The minimum wage paid to all intermediate grade of labor employed on this contract shall be 65c. per hour. The minimum wage paid to all unskilled labor employed on this contract shall be 40c. per hour.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file in the office of the State Highway Department, Trenton, N. J., and may be inspected by prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) for each set of plans upon application to A. L. Grover, Chief Clerk, State Highway Department, Room 102, State House Annex, Trenton, N. J. Bids must be made on the standard proposal forms in the manner designated in the standard State Highway specifications and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal form and special addressed envelopes will be furnished on application. Bids not enclosed in special envelopes will be considered informal and will not be opened. The right is reserved to reject any or all bids.

Signed: E. DONALD STERNER,
State Highway Commissioner.

U. S. Government

PROCUREMENT DIVISION, Public Works Branch, Washington, D. C., Dec. 14, 1935. —Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., Jan. 27, 1936, for furnishing all labor and materials and performing all work for the *extension and remodeling of the U.S.P.O. & Ct.H. at Quincy, Ill.* Attention is directed to the special conditions of bidding set forth in the specificaion. Upon application, two sets of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $10 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. REYNOLDS, Assistant Director of Procurement, Public Works Branch. (262)

PROCUREMENT DIVISION, Public Works Branch, Washington, D. C., Dec. 16, 1935. —Sealed proposals in duplicate will be publicly opened in this office at 1 P.M., Jan. 27, 1936, for furnishing all labor and materials and performing all work for the *extension and remodeling* (except elevators) *of the U.S.P.O., and CT.H., Grand Forks, N. Dak.* Attention is directed to the special conditions of bidding set forth in the specification. Upon application, two sets of drawings and specifications will be supplied free to each general contractor interested in submitting a proposal. The above drawings and specifications MUST be returned to this office. Contractors requiring additional sets may obtain them by purchase from this office at a cost of $10 per set, which will not be returned. Checks offered as payment for drawings and specifications must be made payable to the order of the Treasurer, U. S. Drawings and specifications will not be furnished to contractors who have consistently failed to submit proposals. One set upon request, and when considered in the interests of the Government, will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, but this privilege will be withdrawn if the sets are not returned after they have accomplished their purpose. W. E. REYNOLDS, Assistant Director of Procurement, Public Works Branch. (263)

(Continued on page 51)

OFFICIAL PROPOSALS

(Continued from opposite page)

Bids: January 10, 1936.

Passenger Elevator

THE DELAWARE RIVER JOINT COMMISSION
Camden, New Jersey.

Sealed bids will be received for furnishing and installing one 1200 pound duty passenger elevator in the Administration Building, Camden, New Jersey to be identified as Contract No. BA-2 at the office of The Delaware River Joint Commission, Administration Building, Bridge Plaza, Camden, New Jersey until 1.30 o'clock, P.M. Eastern Standard Time, January 10, 1936 and then and there will be publicly opened and read.

A more complete description of the work and full information for bidders are given in the specifications and contract drawings which may be obtained upon deposit of $10.00 which will be remitted upon receipt of bid or the return in good condition of the copies so taken within thirty days after the opening of bids.

The right is reserved to reject any or all bids.

GEORGE H. EARLE,
Chairman.
JOSEPH K. COSTELLO,
Secretary.
THE DELAWARE RIVER JOINT COMMISSION

Eighth Street Storm Sewer

AMBRIDGE, PENNA.
P.W.A. PROJECT NO. PA. 1123

Attention is directed to Advertisements appearing in "The Citizen" and "News Herald" of Ambridge, Penna., under dates of December 20th, 27th, 1935 and January 3rd, 10th, 1936, inviting proposals for the construction of a Storm Sewer consisting of approximately 2,140 feet Reinforced Concrete Masonry Sewer in sizes from 60" to 84"; 2,284 feet Pre-cast Concrete Pipe in sizes from 30" to 48"; and 2,486 feet Terra-Cotta Pipe in sizes from 12" to 24"; 39 manholes and 30 catch basins; and 23,500 Cu.Yards excavation.

Full information may be obtained from the Borough Engineer, Borough Building, Ambridge, Penna. Plans, Specifications may be obtained upon deposit of ten (10) Dollars.

Borough of Ambridge,
by S. L. CARD,
Secretary of Council.

Bids: January 13, 1936.

Sewage Treatment Plant Equipment

Yakima, Washington.

Sealed proposals for mechanical equipment for a sewage treatment plant will be received by the City of Yakima, Washington, up to the hour of 2:00 o'clock P.M. on Monday, the 13th day of January 1936. Proposals should be addressed to the City Commission and delivered to the City Clerk.

The equipment for which bids are asked consists of the following:

1. One (1) mechanically cleaned bar screen.
2. Four (4) primary sedimentation basin units.
3. One (1) mechanical grit removal unit.
4. Two (2) sludge pumps.
5. Digester mechanisms.
6. One (1) gas holder of 10,000 cu.ft. capacity.

The plant is to provide for primary treatment only. Bids will be considered on one or more items.

Each bid or proposal must be accompanied by cash or a certified check payable to the order of the City Treasurer of said City for the sum of not less than 5% of said bid or proposal; to be forfeited to the City of Yakima in the event the successful bidder shall fail or refuse to enter into a contract with the City for aforesaid equipment.

Plans and specifications are on file at the office of the City Engineer in Yakima and at the office of Stevens & Koon, Consulting Engineers, 1202 Spalding Building, Portland, Oregon. Prospective bidders may obtain copies thereof on application accompanied by a deposit of Five ($5.00) Dollars. The deposit will be returned to all those who submit bona fide bids or who return the plans and specifications within five (5) days after their receipt and inspection.

The City reserves the right to reject any or all bids and to consider any bid on equipment which is applicable to the service required.

By order of the City Commission.
PEARL BENJAMIN,
City Clerk.

AT PUBLIC AUCTION

IN SINGLE LOTS WITHOUT LIMIT OR RESERVE

Surplus Contracting Equipment of Triest Contracting Corp.

PHILIP SMITH, Auctioneer, sells by PUBLIC AUCTION

Friday, January 3rd, 1936, at 12 noon, on premises

Foot of Hudson St., 1 Block from City Hall, Camden, New Jersey

CONSISTING OF

2—Koehring Combination Shovels & Cranes, Model 301 with Shovel Attachments, 30' and 45' Crane Booms.

2—Lidgerwood-Otis Cranes with 16' Reinforced Booms, Mounted on Chalmers 4 Cyl. Tractors.

40—Jack Hammers, Paving Breakers, Concrete Surfacing Machines, Clay Diggers and Close Quarter Drills, etc.

6—McKiernan-Terry Pile Hammers.

3—Gardner-Denver Sheeting Hammers.

1—Vertical Air Receiver, 4½'x14'x125.

24—Jacks, Hydraulic—Dudgeon—Shoring—Screw—Barrett Track—Steamboat Ratchet, etc., 7 ton to 100 ton.

1—Special Drop Hammer—1 Chicago Pneumatic Corner Drill—2 I.-R. Tugger Air Hoists—6—1, 2 and 3 ton Ford Chain Blocks.

3—Owen & Orange Peel Buckets to ¾-yd. capacity.

1—Reach Truck with 4 Fire Engine Wheels—1 Ford Pick Up Truck—1 International Truck with Covered Body.

3—Chicago Pneumatics—Stationary 14x12—Electrically Operated with 100 H.P. G. E. Slip Ring Motors.

1—Ingersoll-Rand Portable Air Compressor 10x8.

14—Pumps—Barnes—La Bour—Domestic—Lawrence—Chicago Pneumatics Gas & Electric 4" to 8".

1—Vulcan Pile Extractor No. 800.

Also Tannewitz Band Saw—2 Portable Air Saws—Contractors' Saw Bench with 10 hp. Motor—3 I.R. Wood Borers—Black & Decker Bench Grinder—Mueller Water Tapping Machine—Shimmy Spade Concrete Vibrator—Air Driven Pipe Tapper—4 Sets Cutting and Welding Torches—Chain Tongs—Concrete Dump Cars—Buggies, Chutes, Hoppers, etc., and Large Quantities of Miscellaneous Hose, Wire and Manila Rope—Driving Heads—Tampers—Picks—Shovels—Rakes—Hammers—Wrenches—Mandrels—Lanterns—Jute Lead—Raincoats—Boots—Fire Extinguishers and Miscellaneous Hardware—Fittings—Supplies and Electric Material, etc., etc.

All of the above to be sold in single lots without limit or reserve and consists of equipment of the better kind.

OPEN FOR INSPECTION FROM DECEMBER 30th, 1935 to DATE OF SALE.

For Further Information and Descriptive Catalogue Write, Wire or Call.

Auctioneer's New York Office 653-655 Broadway—Tel. Algonquin 4-3590
Telephone on Premises.

USED REBUILT
SURVEYING INSTRUMENTS
SALE—RENT REPAIRING

RE-BUILT ALL MAKES
REPAIR
RENT
REAL EXPERTS

BUFF, 69 Dey St., New York

EXCEPTIONAL VALUES
For Quick Disposal
BERGER, K. & E., & Gurleys
Rebuilt Engr's. Transits & Wye Levels. Late models, (guar.). *Act quickly.* Instruments **Rented or Exchanged.** *All makes repaired,* reasonable prices.
J. H. WEIL & CO.
1325 Cherry St., Philadelphia, Pa.
Established 35 years

BE SURE—
of quality repairs! Finest workmanship at reasonable cost guaranteed. Quick service—shipping cases supplied. Rebuilt, new, used instruments for sale. Instruments rented—used instruments bought.
CHARLES BRUNING COMPANY, Inc.
102 Reade Street 448 Plymouth Court
New York, N. Y. Chicago, Ill.
(Agents of C. L. Berger and Sons)

OFFICIAL PROPOSALS

Bids: January 7, 1936.

Waterworks

VIENNA, ILLINOIS

Sealed Bids will be received by the City of Vienna, Illinois, in the City Hall until Tuesday, January 7, 1936, at 4:00 o'clock P.M., C.S.T., for construction of Earth Dam and Concrete Spillway, Filter Plant, Water Distribution System, Elevated Tank and Appurtenances.

Plans and specifications may be had upon application to City Clerk, Vienna, Illinois, upon deposit of $10.00, one-half of which will be refunded as per official notice. The right is reserved to accept or reject any and all bids.

CITY COUNCIL
VIENNA, ILLINOIS

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ENGINEER executive, long experienced in construction and management of large works, desires position as manager of utility, contracting company, industrial plant, or association with consulting engineer. PW-189, Engineering News-Record, 520 No. Michigan Ave., Chicago, Ill.

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SALES MANAGER—Just completing sale of surplus equipment, supplies and materials on large project. Can show results. Available early 1936. PW-200, Engineering News-Record, 330 West 42d St., New York City.

SUPERINTENDENT seeks position. Well experienced in school, residential, industrial building contracts. Unquestionable record of ability, integrity. Fully cognizant of present conditions. Active, dependable. Anywhere. PW-192, Engineering News-Record, 330 West 42d Street, New York City.

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W-194, Engineering News-Record
330 West 42d St., New York City

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With Extension to Cut 12' Deep.
JOHN M. BOLAN
602 Liberal Savings Bank, Cincinnati, Ohio

Notice to Advertisers

Because of the Holiday, New Year's Day, January 1st, the "Searchlight" pages of the

January 2nd issue of

ENGINEERING NEWS-RECORD

close for press earlier than the usual weekly closing time.

The cooperation of advertisers is solicited in forwarding new copy, or changes of copy, to reach us accordingly.

FINAL CLOSING TIME

Display and Undisplayed Ads:
Friday, December 27th

Proposals: Monday 4 P.M.
December 30th

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1—Link Belt K-25 Ser. 1521 combination crane and shovel with ⅝-yd. dipper, 60-ft. crane boom.
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1—Link Belt K-1, Ser. 1024, 50-ft. boom, 1-yd. bucket.
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5—Loco. cranes; sta. ga. 30 & 25-t.; Ohio, Browning, American, Indus'l.

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17—Steam hammers, including Vulcan, McKiernan-Terry, Union.

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All sizes and makes of jackhammers, concrete breakers, spades, riveters, drills, wood borers and grinders.

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Crane Capacity—25 tons.
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All Large Cities.

(Continued from page 46)

U. S. Government

SEALED BIDS, INDORSED "Bids for improvements to fuel oil plant, Specification No. 7447," will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until 11 o'clock a.m., 15 January, 1936, and then and there publicly opened, for *alterations to pumphouse and fuel oil piping system and new motor-driven fuel oil pump and piping at the Naval Fuel Depot, Pearl Harbor, T. H.* The Government reserves the right to require, prior to the award of the contract, a statement of facts in detail of the business and technical organization and plant of the bidder available for the contemplated work, including financial resources for such part of the work as is not provided for by the stipulation in article 16 of the contract and experience of organization in construction of comparable work. The Government reserves the right to reject any bid respecting which the facts as to business and technical organization, financial resources, plant, or experience, compared with the project bid upon, justify such rejection. Specification No. 7447 and accompanying drawings may be obtained on application to the Bureau or to the Commandant, Fourteenth Naval District, Navy Yard, Pearl Harbor, T. H., or to the Commandant, Twelfth Naval District, 100 Harrison Street, San Francisco, Calif. Deposit of a check or postal money order for $15, payable to the Chief of the Bureau of Yards and Docks, is required as security for the safe return of the drawings and specification. NORMAN M. SMITH, Chief of Bureau, November 15, 1935. (261)

WAR DEPARTMENT, Office of the Constructing Quartermaster, Fort Knox, Kentucky. Sealed proposals will be received at this office until 10:00 A.M., C.S.T., January 13, 1936, and then publicly opened for *construction of Filtration Plant, Pumping Station, Sixteen-inch Cast Iron Force Main, Elevated Steel Tank, Dam, Electric Lines,* other structures and utilities thereto *at Fort Knox, Kentucky.* Plans and specifications will be furnished upon deposit of certified check in the amount of $50.00, made payable to the Treasurer of the U. S. Information at the above address. (256)

SEALED BIDS will be received at the U. S. Engineer Office, 932 U. S. Post Office Building, Canal and Van Buren Streets, Chicago, Illinois, until 10:00 a.m., C.S.T., February 3, 1936, and then publicly opened, *for construction of one 15-ton steel-hull steam-operated A-frame derrick boat, complete with one heavy-duty clamshell bucket,* and its delivery afloat on the Illinois River, *at the U. S. Boat Yard, Peoria, Illinois.* (264)

U. S. Government

COMMISSIONERS, D. C., Washington, December 11, 1935.—Sealed proposals will be received at Room 509, District Building, until 2 p.m., December 26, 1935, and then publicly opened *for construction, etc., of Building C, Adult Unit, at site of Tuberculosis Sanatoria, near Glenn Dale, Prince Georges County, Maryland.* A more complete description of the work and full information for bidders is given in the drawings, specifications, and in other contract papers, which may be obtained at Room 427, District Building, upon deposit of a certified check payable to the Collector of Taxs, D. C., in the sum of fifty dollars ($50.00) to insure return in good condition. Not more than three (3) complete sets of drawings and specifications and contract papers will be furnished to any one (1) general contractor. No proposal will be accepted unless accompanied by a guaranty of not less than five per cent (5%) of the amount of the bid in the form of a certified check made payable to the Collector of Taxes, D. C., U. S. Bonds, or the bond of an approved surety company. Security for the faithful performance of the work shall be in the form of a surety bond in a penal sum equal to the estimated total contract price. A labor bond in an amount equal to the largest estimated aggregate payroll for any one month is required. Public liability insurance in the sum of $5,000 and $10,000 is also required. The work called for by this proposal is to be performed in accordance with an agreement dated December 19, 1934, between the Commissioners of the District of Columbia and the Federal Emergency Administrator of Public Works and is subject to the construction regulations and labor provisions of Bulletin No. 2 of the Federal Emergency Administration of Public Works dealing with non-Federal projects, revised March 1, 1935. The director of Reemployment for the District of Columbia is Edgar B. Young, 480 Indiana Avenue, N.W. The Commissioners reserve the right to reject any or all proposals and to waive informalities as they deem best for the interest of the District of Columbia. Final award of contract is subject to approval of the Federal Emergency Administrator of Public Works. No bidder may withdraw his proposal for a period of thirty (30) days after the date for the opening thereof. Attention is called to the fact that not less than the minimum wage rates prescribed by the Federal Emergency Administration of Public Works must be paid on this project. MELVIN C. HAZEN, GEORGE E. ALLEN, DAN I. SULTAN, Commissioners, D. C. (252)

OFFICIAL PROPOSALS

Bids: January 15, 1936.

Sewage Disposal Plant

LAWRENCEBURG, INDIANA

Sealed proposals for a sewage disposal plan will be received by the City of Lawrenceburg, Indiana, until 2:00 P.M., C.S.T., Jan. 15, 1936, at office of the City Clerk, as per plans and specifications on file there, as prepared by Chas. Brossman, Consulting Engineer, Indianapolis. The work includes construction of a complete sewage disposal plant with all equipment, accessories, pump station, sludge storage tank, sludge drying beds with glass cover, Imhoff tank, dosing tank, sprinkling filters, Humus tank, pumping equipment, gas heating equipment, miscellaneous piping and equipment as specified.

Proposals must be executed on forms furnished by Engineer accompanied by Questionnaire Form 96-A required by Ind. Laws for any bid over $5,000.00. Proposals also to be accompanied by certified check or acceptable bidder's bond of not less than 5% of bid price.

Contractor must furnish surety company bond amounting to 100% of contract to remain in effect one year, and to include maintenance clause.

Work is under terms and conditions of National Industrial Recovery Act and subject to its conditions and regulations, and to the conditions of a Loan & Grant Agreement between the Federal Govt. and the City of Lawrenceburg, now on file with the City.

Wage rates to be not less than the prescribed scale for wages as determined pursuant to provisions of Chapter 319 of Acts of the General Assembly of Ind., 1935, and as approved by the Federal Govt.

City reserves right to reject any or all bids, or accept such bid as most advantageous to the City. Bidder may not withdraw bid for a period of 30 days after opening, and shall inform himself of all conditions of construction and labor for said work.

Full information, plans, etc. on file with City Clerk, Lawrenceburg, Ind., or may be obtained from the Engineer at Indianapolis upon deposit of $25.00, one-half of amount returnable when plans are returned within thirty days.

H. B. HERRICK, City Clerk,
By order of Common Council
Lawrenceburg, Indiana
December 16, 1935.

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An index of products made by manufacturers whose advertisements appear in this issue of Engineering News-Record

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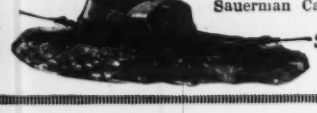

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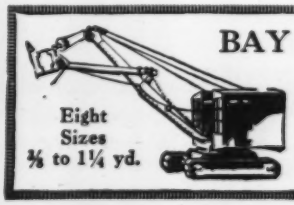

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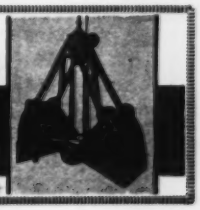

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Joseph T. Ryerson & Son, Inc.; Complete steel-service plants at:
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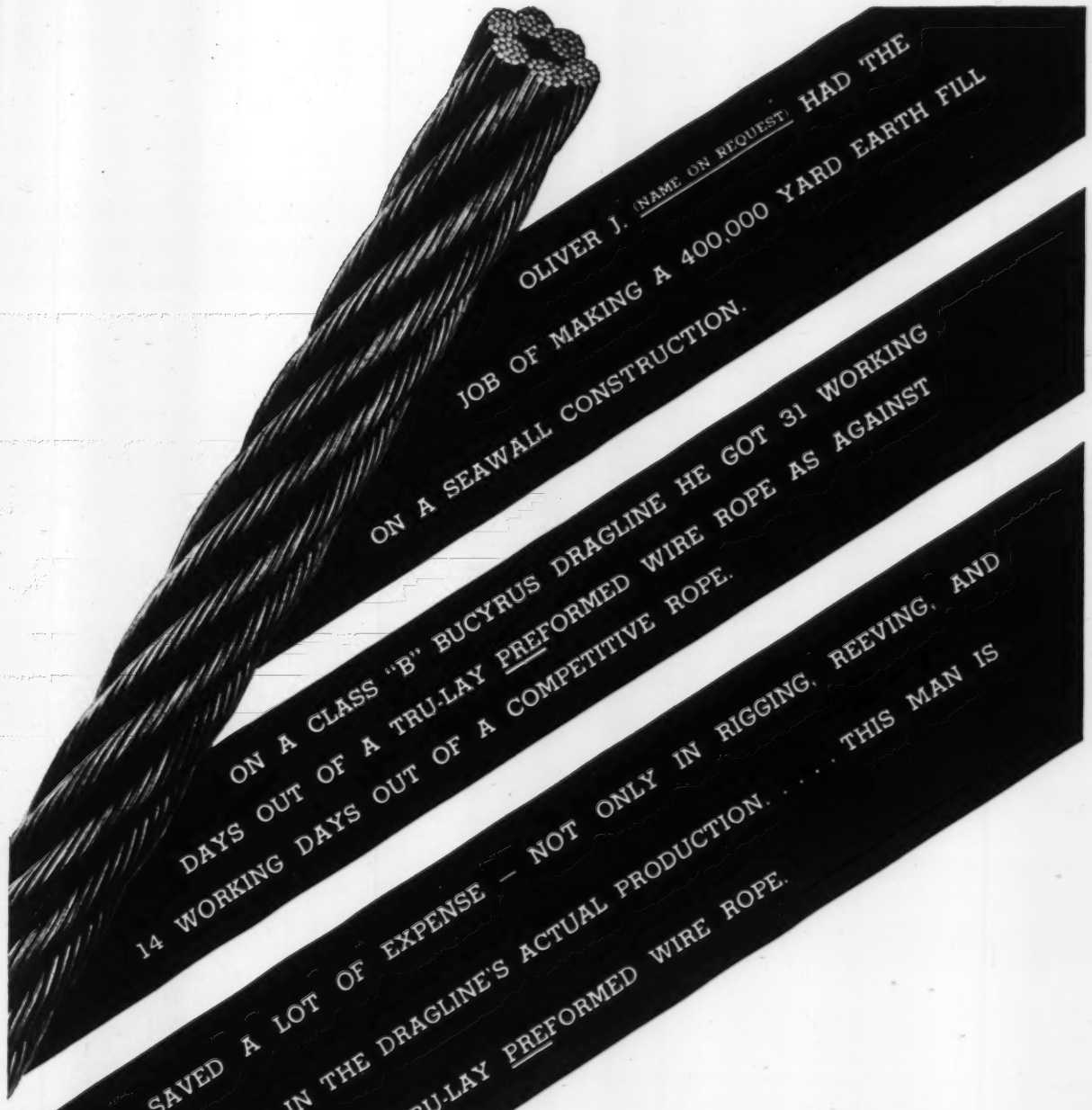

OLIVER J. (NAME ON REQUEST) HAD THE JOB OF MAKING A 400,000 YARD EARTH FILL ON A SEAWALL CONSTRUCTION.

ON A CLASS "B" BUCYRUS DRAGLINE HE GOT 31 WORKING DAYS OUT OF A TRU-LAY PREFORMED WIRE ROPE AS AGAINST 14 WORKING DAYS OUT OF A COMPETITIVE ROPE.

THIS SAVED A LOT OF EXPENSE — NOT ONLY IN RIGGING, REEVING, AND MEN'S TIME, BUT IN THE DRAGLINE'S ACTUAL PRODUCTION. . . . . THIS MAN IS VERY ENTHUSIASTIC OVER TRU-LAY PREFORMED WIRE ROPE.

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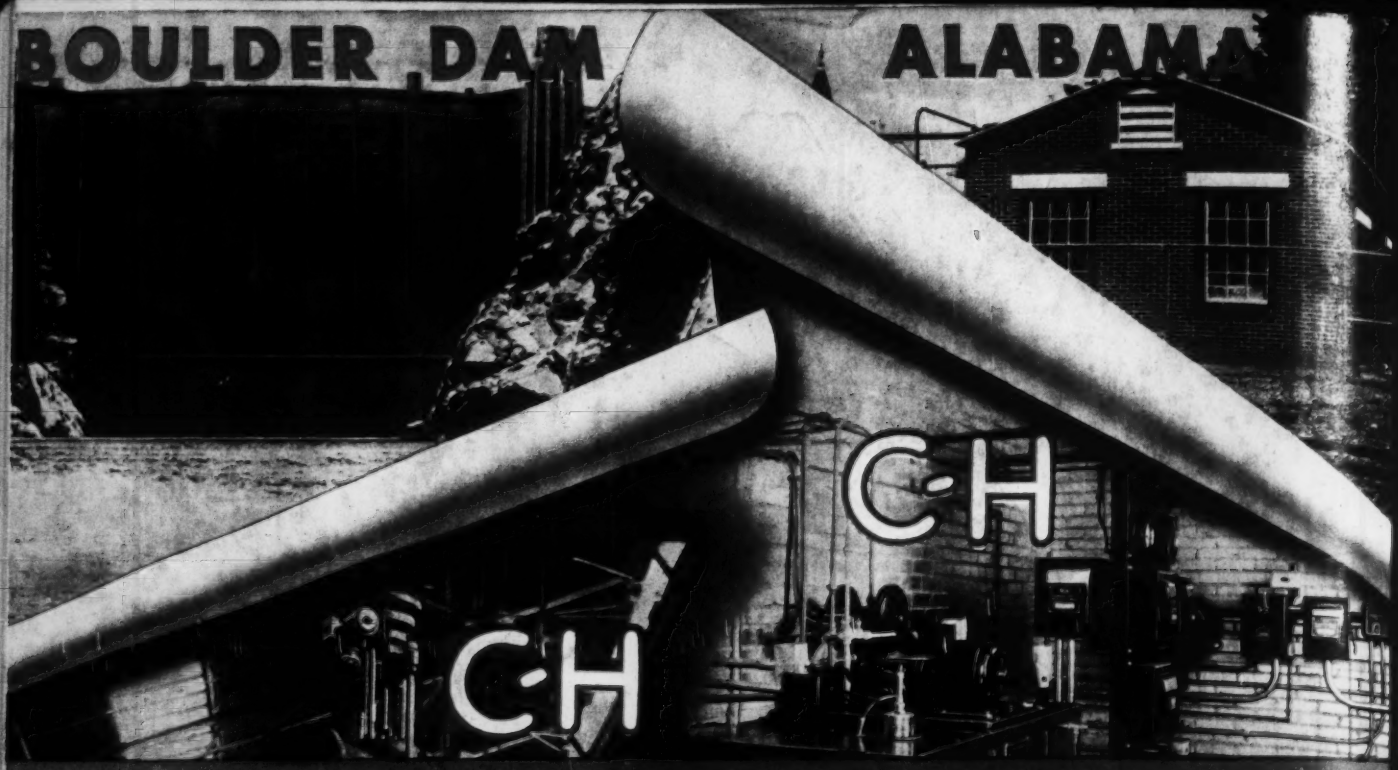


and...EVERYWHERE!

On Waterworks, Sewage and Filtration Projects C-H is the Preferred Control *The Nation Over*

The reason for this preference is easy to understand. C-H Engineers long ago tied themselves together for massed and unending attack on Motor Control problems. Such specialization is the only road to topnotch quality in any field. The worthwhileness of it has shown before, shows now, in the surge of approval in Public Works for C-H Control. Thus:

BOULDER DAM. C-H Valve Control on Schutte & Koerting 24" waterjet eductor for draining Boulder Dam Power Plant.

ALABAMA. C-H Calorimeter, Recorder, Control Panel and starting switches in instrument room, Troy, Alabama Butane Gas Plant.

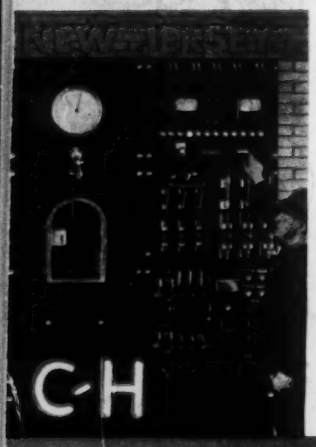
COLORADO. One of several C-H Valve Control Units, operated from Einfeldt Pumping Station switchboard, Water Department, City and County of Denver.

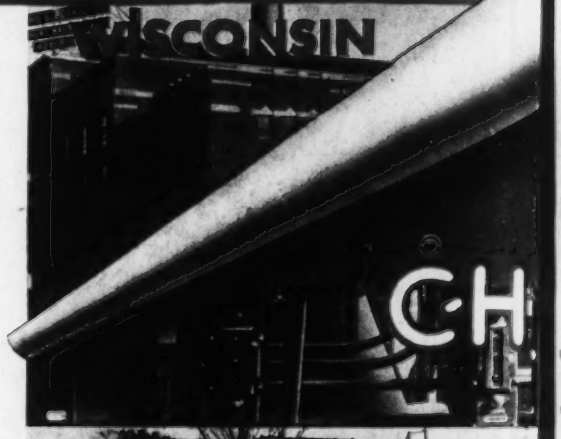
NEW JERSEY. Panel for C-H Control, on pumps, fan, blower and valves in sewage pumping plant, Asbury Park.

WISCONSIN. C-H Control master stations for control of steam line valves, Port Washington Power Plant.

ILLINOIS. C-H control panel for 54" sluice gate in Rockford Sewage Treatment Plant.

C-H Engineers are competent to help at any stage. Address communications to CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus,* 1261 St. Paul Avenue, Milwaukee, Wisconsin.





CUTLER-HAMMER C-H MOTOR CONTROL

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